

NHDOT 16396A
US Route 302 over Sawyer River

Standard Dredge and Fill Application





**DEPARTMENT OF ENVIRONMENTAL SERVICES
WETLANDS BUREAU**

29 Hazen Drive, PO Box 95

Concord, NH 03302-0095

Phone: (603) 271-2147 Fax: (603) 271-6588

Website: <http://des.nh.gov/organization/divisions/water/wetlands/index.htm>

Email: wetmail@des.nh.gov



**Standard Dredge and Fill Application Form
for Department of Transportation Projects**

The Standard Dredge and Fill application package to be submitted to DES consists of:

1. Application form (this document).
2. Checklist(s) with required information attached. ("Checklist for Submission of your Standard Dredge and Fill Application," and if appropriate, "Compensatory Mitigation Information and Checklist").

Type or print clearly -- missing information may result in your application review being delayed if it is considered administratively incomplete. If you are completing this as a Word version on your computer, use your **tab key** to move through the document to enter data in the appropriate areas.

If you have questions about any terms used, check the Definitions section of the Instructions.

1.	Name of Landowner* (last, first, middle initial)	Owner daytime phone number	Owner fax number	Owner email
	NH Department of Transportation	(603) 271-1915	(603) 271-7199	
Landowner (permanent) mailing address or PO Box		Town/City (owner mailing address)	State	Zip code
7 Hazen Drive, PO Box 483		Concord	NH	03302
2.	Name of Applicant (Bureau or District)	Applicant phone number	Applicant fax number	Applicant email
	Robert Landry, Bridge Design	(603) 271-2731	()	RLandry@dot.state.nh.us
	Applicant street address	Applicant town/city	State	Zip code
3.	Company and Name of Agent	Agent phone number	Agent fax number	Agent email
	McFarland Johnson, Vicki Chase	(603) 225-2978	(603) 225-0095	vchase@mjinc.com
Agent Street mailing address or PO Box		Town/City (agent mailing address)	State	Zip code
53 Regional Drive		Concord	NH	03301
4.	Location(s) of the proposed work (fill in below)			
Street address(es) or nearest intersection(s)		US Route 302		
Town/City	Portsmouth	Tax map	NA	Block
			NA	Lot number(s)
				NA
5.	For projects classified as minor or major impact, are there any vernal pools located within the existing or proposed right-of-way or easement areas within the limits of the project?			Circle one:
	If "Yes," identify and label the location(s) of vernal pool(s) on the project plans.			Yes <input checked="" type="radio"/> No <input type="radio"/>

6.	<p>Based on information obtained from the Natural Heritage Bureau (NHB), are there any state or federal threatened or endangered species or exemplary natural communities in or near the subject project?</p> <p>Provide the NHB file number: NHB11-1845 and attach the documentation (letter/memo & map)</p> <p>Natural Heritage information can be obtained at www.nhnaturalheritage.org. Click on "Services" for links to: 1) the DataCheck web tool, or 2) a hard copy form to obtain the required letter and map from NHB. If you do not have Internet access, you may contact NHB directly at (603) 271-2215 x 323 for information about obtaining the required documentation.</p>	<p>Circle one: <input checked="" type="radio"/> Yes <input type="radio"/> No</p>
7.	<p>If there are any state or federal threatened or endangered species or exemplary natural communities located in or near the subject project, please provide a letter from NHB stating that the applicant has consulted with NHB. The letter should indicate either there is no impact, or include NHB guidelines for preventing or mitigating impacts.</p>	
8.	<p>Jurisdictional areas(s) where work is proposed; check box(es) below. Check the definitions in the instructions for additional information. (If your resource type is not listed, contact DES for guidance):</p>	
Nontidal wetland: swamp, wet meadow, etc.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Bank of surface water body</div> <div style="margin: 0 10px;">x</div> </div>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Intermittent (seasonal) stream</div> <div style="margin: 0 10px;"></div> <div style="border: 1px solid black; padding: 2px 5px;">Name of water body from USGS topographic map: Sawyer River</div> </div>
Vernal pool	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Lake or pond</div> <div style="margin: 0 10px;"></div> </div>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Perennial stream or river</div> <div style="margin: 0 10px;">x</div> <div style="border: 1px solid black; padding: 2px 5px;">Tributary to:</div> </div>
Upland tidal buffer zone	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Sand dune</div> <div style="margin: 0 10px;"></div> </div>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Tidal wetland</div> <div style="margin: 0 10px;"></div> <div style="border: 1px solid black; padding: 2px 5px;">Prime Wetland Buffer (within 100 feet of prime wetland)</div> </div>
Freshwater marsh	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Bog/fen (peatland)</div> <div style="margin: 0 10px;"></div> </div>	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px 5px;">Atlantic Ocean</div> <div style="margin: 0 10px;"></div> <div style="border: 1px solid black; padding: 2px 5px;">Municipally designated prime wetland</div> </div>
9.	<p>Provide a brief description of all proposed work. Attach a separate page if necessary.</p> <p>See attached Supplemental Narrative.</p>	
10.	<p>Does the project require compensatory mitigation to offset unavoidable impacts to wetlands? If Yes, attach a copy of the completed Mitigation Checklist.</p>	<p>Yes <input checked="" type="radio"/> No</p>
11.	<p>Have you requested a waiver of any wetland rules per Env-Wt 204? If Yes, attach your waiver request to this application.</p>	<p>Yes <input type="radio"/> No</p>
12.	<p>Is there any DES emergency authorization associated with this project? Are you aware of any DES enforcement issues related to this project? If Yes, provide the file number(s): <u>verbal authorization</u></p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>
13.	<p>Explain why it is necessary to impact a wetland or other jurisdictional area to construct your project.</p> <p>See attached.</p>	

14.	<p>Explain why your project design proposes less environmental impact on areas in DES Wetlands jurisdiction than other alternatives. What other alternatives were considered? (Attach a separate page if you are not completing this expandable box on a computer)</p> <p>See attached.</p>
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15.	Amount of Impact Proposed By Jurisdictional Area			
	Indicate whether permanent or temporary impacts. This information is necessary to calculate the fee and classify your project. Leave box blank if not applicable to your proposed project.			
Jurisdictional area	Impact Type			
	Temporary	Permanent	Total	Unit
Wetlands				sq. ft.
Prime wetland				sq. ft.
Vernal pool				sq. ft.
Prime Wetland Buffer (within 100 feet of designated prime wetland)				sq. ft.
Stream or River				
Bank of stream or river (OHW-TOB)	10	290	300	linear feet
	2,607	11,943	14,550	sq. ft.
Bed of perennial stream (below OHW)	20	220	240	linear feet
	2,540	2,826	5,366	sq. ft.
Thread of Intermittent Stream (below OHW)				linear feet
Bank of Lake (for <u>beach construction & replenishment</u> , bank stabilization)				
Shoreline (see following page for how to calculate this average length)				linear feet
Dredge/fill within bank (NHW-TOB)				sq. ft.
Dredge/fill within bank (NHW-TOB)				cubic yards
Lake or Pond (below full lake elevation) Impacts <u>for docks and structures</u> listed in item 15 are entered below.				
Shoreline subject to impacts				linear feet
				sq. feet
Dredge or fill of lakebed (below NHW)				cubic yards
				sq. ft.
Sand dune				sq. ft.
Tidal wetland				sq. ft.
Upland tidal buffer zone				sq. ft.
Undeveloped?/ Developed? (choose one or both, as appropriate)				Developed

16. Calculate and provide length of shoreline frontage.

Shoreline frontage is the average of two distances, 1) the actual natural navigable shoreline footage, and 2) a straight line drawn between property lines, both of which are measured at the normal high water line.

(a) Pin to pin distance (linear feet)	(b) Actual natural navigable shoreline (from pin to pin)	$\frac{(a) + (b)}{2} =$	Shoreline frontage (linear feet)

17. Enter the information below if you are proposing any **docking structures. Your plans must show proposed and existing docking structures.**

Docking structures (proposed)	Square Feet
Surface area of all permanent structures:	N/A
Surface area of all seasonal structures:	N/A

18. Other DES Permitting Requirements (write in "Yes" or "No")

yes Have you addressed requirements of Comprehensive Shoreland Protection Act (CSPA), RSA 483-B?

If your property is in the "protected shoreland" -- the area that is within 250 feet of a fourth order stream, a designated river, a lake or pond 10 acres or greater in size (on the DES *Official List of Public Waters*), or tidal water, you will need to comply with the requirements of the Comprehensive Shoreland Protection Act (CSPA).

What is considered "protected shoreland"? To determine if your property is located in "protected shoreland," go to www.des.nh.gov/cspa or the following websites:

- A "fourth order" or larger stream or river (www.des.nh.gov/cspa).
- Any river or river segment designated as protected under the N.H. Designated Rivers Program, RSA 483 (www.des.nh.gov/rivers/).
- Public waters (www.des.nh.gov/Dam/)
- Tidal waters.

As of July 1, 2008, projects that involve construction, excavation, or filling within the protected shoreland, require a DES Shoreland Permit, unless the work is specifically permitted under a Wetlands Permit, OR exempted under Rule Env-Wq 1406.03 or Env-Wq 1406.04 (see des.nh.gov/rules/desadmin_list.htm#env-wq1400), and a DES Alteration of Terrain permit 50,000 square feet if any part of disturbance is within the protected shoreland. For more information: www.des.nh.gov/AOT/ and RSA 485-A:17.

no Does this project require a DES Alteration of Terrain (AoT) permit? If yes, does this application and the other application reflect the same project area in its entirety? (*N/A per Memorandum of Agreement dated April 16, 2003.*)

no Does this project require a DES Subdivision or Subsurface Disposal System permit(s)? If yes, does this application and the other application reflect the same project area in its entirety?

Date of Subsurface/Subdivision application submittal to DES: _____
DES Subsurface/Subdivision File number: _____

19. In accordance with RSA 482-A:3, XIV (b), I, Robert Landry, hereby authorize DES to communicate all matters relative to this application electronically with the individual identified below at the email address identified below. I agree to send an electronic return/read receipt of all emails sent by the department and understand that the department will do the same. I also agree that DES will be notified immediately of any change in the email address identified below. Please note that DES limits the size of documents that can be received or stored electronically. Any submittals that have a file size over 5 MB must be provided in hard copy.

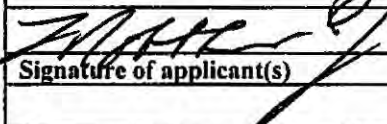
(Check one box only and supply email address)

☐ Landowner email: _____ Applicant email: rlandry@dot.state.nh.us
☐ Agent email: _____ [x] NHDOT Bureau of Environment email: bureau16@dot.state.nh.us

20. **FILING FEE:** A check or money order payable to the NH DES Wetlands Bureau must accompany this application. The minimum fee is \$200. Minor and major impact projects are charged at the rate of: \$0.20 per square foot of requested impact (if less than 1,000 square feet of impact is proposed, the minimum fee of \$200 applies). All applications for shoreline structures shall include a base fee of \$200. In addition, minor and major impact shoreline projects shall include fees charged at the rate of: \$0.20 per square foot for requested dredge or fill impacts; \$1 per square foot for requested seasonal docking structure; and \$2 per square foot for requested permanent docking structure. The application will be considered administratively incomplete until the required fee is paid in full.

21. **APPLICANT SIGNATURE.** By signing this application, I am certifying that:

- 1) All abutters have been identified in accordance with the definition given in the instructions and I or my agent have/has sent notices to those abutters by Certified Mail. N/A – not required for public road projects per Env-Wt 501.01(c).
- 2) I have read and provided the required information outlined in Env-Wt 302.04 and listed on the "Checklist for Submission of Your Standard Dredge and Fill Application," dated June 2008.
- 3) I have read and understand Env-Wt 302.03 and have chosen the least impacting alternative.
- 4) I have reviewed the information being submitted and that to my knowledge the information is true and accurate.
- 5) I have appropriately coordinated with the NH State Historic Preservation Officer.
- 6) I authorize the municipal conservation commission to inspect the site of the proposed project.
- 7) I understand that the willful submission of falsified or misrepresented information to the New Hampshire Department of Environmental Services is a criminal act, which may result in legal action.

	Robert Landry	2/21/2012
Signature of applicant(s)	Print applicant's name(s)	Date
Signature of authorized agent (if applicable)	Print agent name	Date

22. **TOWN CLERK SIGNATURE:** I hereby certify that the applicant has filed five sets of all materials with the town/city of N/A as required by Chapter 482-A:3, and I have received and retained certified postal receipts (or copies) for all abutters identified by the applicant. Upon signing the application below, I will forward immediately by certified mail to the DES the original application materials, including the filing fee, and distribute the three copies to each of the following: the local governing body, the municipal planning board, if any, and the municipal conservation commission, if any. Town clerk retains one copy.

N/A – applications for public road projects are submitted directly to the NHDES and copies are sent to the town/city.

Signature of town/city clerk	Date
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For DES Office Use Only:					
Fee received (amount): _____		DES File # _____		Name on check: _____	
date of check	date check received	check#	amount	initials	
Additional check: Date of check: _____		Date check received: _____		Check number: _____ Check amount: _____	

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Figure: Wildlife Habitat

Figure: Watershed

Photos

NHF&G Fisheries Email Correspondence

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Sawyer River Preliminary Hydraulic Summary

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US Route 302 over Sawyer River - State Project No. 16396A
Standard Dredge and Fill Supplemental Narrative

Introduction

The proposed project involves replacing the bridge that carries Route 302 over the Sawyer River in Hart's Location, New Hampshire. The existing bridge was a 46 foot wide steel girder with concrete deck structure and had a single span of 95 feet. It was heavily damaged during the rains from Hurricane Irene on August 30, 2011. A temporary bridge has been in place since September 17, 2011. The temporary bridge is east of the damaged bridge and lies on the alignment that Route 302 formerly followed, and uses, in part, the abutment from the bridge that supported the old bridge.

Questions from Standard Dredge and Fill Application

9. Provide a brief description of all proposed work including: 1) the size of the impact area (square feet) in the resource, 2) the size (in acres) of the entire parcel(s), and 3) the compensatory mitigation proposed, if applicable, per Env-Wt 302.03(c).

The proposed project will involve 19,196 square feet of impact to NH jurisdictional resources, including 11,943 square feet of permanent impact to stream bank, for excavation and installation of scour protection, and 2,826 square feet of permanent impact to the bed of the river. There will also be temporary construction impacts totaling 2,607 square feet to bank and 2,540 square feet to the riverbed. The project will occur in the White Mountain National Forest. The NHDOT does not hold a right of way for this roadway, and all work will be completed under a special use permit to be granted by the United States Forest Service. Because the impacts are all either temporary or for infrastructure protection, mitigation is not required under Env-Wt 302.03 (c).

The construction methods and sequence will be left to some degree to the discretion of the contractor. The most likely construction approach and sequence is as follows:

1. Construct temporary sedimentation basin.
2. Place temporary water diversion structure to temporarily relocate channel.
3. Place silt fence as shown on plans.
4. Set up pumps to dewater the area within the construction zone.
5. Install temporary cofferdam systems.
6. Construct bridge foundation systems.
7. Remove temporary cofferdam systems.
8. Construct bridge revetment system.
9. Remove water diversion system.
10. Construct bridge superstructure.
11. Construct roadway approaches.
12. Construct site restoration.

The construction period for this project will be approximately 16 months. The anticipated project schedule is from June, 2012 to September, 2013. All work in the water will be completed within eight weeks during the months of August and September, 2012.

13. Explain why it is necessary to impact a wetland or other jurisdictional area to construct your project.

Impacts to the riverbed and banks are proposed in order to remove the existing bridge abutments, to install the bridge footings and abutments, and to place armoring to protect the bridge footings and stabilize the existing north bank upstream of the bridge.

14. Explain why your project design proposes less environmental impact on areas in DES Wetlands jurisdiction than other alternatives. What other alternatives were considered?

The current bridge location is necessitated by the re-alignment of Route 302 in the early 90's, which provides adequate geometrics and lines of sight. Any alternative alignment would create greater impact on areas of DES Wetland jurisdiction. The design of the bridge footings is necessitated by the boulder substrate under the bridge, which indicated that deep pile footings were not possible at this location.

Env-Wt 302.04 Requirements for Application Evaluation

(a) For any major or minor project, the applicant shall demonstrate by plan and example that the following factors have been considered in the project's design in assessing the impact of the proposed project to areas and environments under the department's jurisdiction:

(1) The need for the proposed impact;

The bridge provides an important link on Route 302, the only north-south highway in this region. Detours around this bridge are at least an hour out of the way. The location of the existing temporary bridge, which was built in the location of the previous bridge before the roadway was re-aligned in 1992, provides substandard roadway geometrics, and the bridge itself is not designed for permanent use.

Impacts to jurisdictional resources are needed in order to remove the existing bridge abutments, to install the new bridge footings and abutments, and to place armoring to protect the bridge footings and stabilize the existing bank.

(2) The alternative proposed by the applicant is the one with the least impact to wetlands or surface waters on site;

Deep foundation alternatives were eliminated from consideration for the proposed bridge replacement as the extremely bouldery substrate under the bridge footings made driving foundation elements impractical.

(3) The type and classification of the wetlands involved;

The Sawyer River is a fourth order stream, Cowardin classification R3RS2. Rosgen river characteristics are as follows:

Table 1 - Rosgen Stream Characteristics

Bankfull width	60 feet
Bankfull depth	6.5 feet
Width/depth	9.2
Flood prone area (width at 2x bankfull depth)	139 feet
Entrenchment Ratio	2.3
Sinuosity (measured from USGS topo)	1.1
Slope (measured from USGS topo)	0.039
Substrate	boulders

The bankfull width is based on a 1.5 year storm, calculated using HEC RAS hydraulic analysis. The river cross section used to calculate the bankfull width and depth is depicted on Sheet 5 of the plan set Wetland Impact Plans, attached. The characteristics of the river most closely match the Rosgen classification B2.

(4) The relationship of the proposed wetlands to be impacted relative to nearby wetlands and surface waters;

The Sawyer River flows into the Saco River approximately a quarter mile downstream from the bridge. There are no associated wetlands along the banks of the Sawyer River in the immediate vicinity of the project.

(5) The rarity of the wetland, surface water, sand dunes, or tidal buffer zone area;

The Sawyer River is a rocky mountain stream typical of rivers in the White Mountains.

(6) The surface area of the wetlands that will be impacted;

The project will involve 2,826 square feet of impact to the bed of the Sawyer River, and 11,943 square feet of impact to the bank of the river.

(7) The impact on plants, fish and wildlife including, but not limited to:

a. Rare, special concern species;

New Hampshire Natural Heritage Bureau provided information that although there was a record of a rare species or exemplary natural community in the vicinity of the bridge, they did not expect any impacts to the species from the proposed project (see attached correspondence).

b. State and federally listed threatened and endangered species;

As above.

c. Species at the extremities of their ranges;

As above.

d. Migratory fish and wildlife;

John Magee of New Hampshire Fish and Game was contacted regarding fisheries concerns in the Sawyer River. His response, attached to this application, requests that there be no instream construction between September 1 and April 1, or, if that is not going to be practicable, then no instream work between September 1 and October 15 to minimize the impact to migrating trout.

e. Exemplary natural communities identified by the DRED-NHB; and

As above.

f. Vernal pools.

There are no vernal pools in the vicinity of the project.

(8) The impact of the proposed project on public commerce, navigation and recreation;

Route 302 is an important link between Crawford Notch and the Presidential Range and the Conway region. The shortest alternative route, to the north through Gorham, is approximately an hour longer. Replacement of this bridge is important for public commerce and recreation.

(9) The extent to which a project interferes with the aesthetic interests of the general public.

The project is not anticipated to interfere with the aesthetic interests of the public. The replacement bridge will be similar in appearance to the bridge that was damaged in the hurricane. Riverbed riprap substrate will be top-dressed with stockpiled natural streambed material.

(10) The extent to which a project interferes with or obstructs public rights of passage or access.

The project will improve public rights of access.

(11) The impact upon abutting owners pursuant to RSA 482-A:11, II.

As a linear public transportation project, the roadway technically has no abutters. As described above, the roadway and bridge are within the White Mountain National Forest, and will be rebuilt under a special use permit to be granted by the USFS. The proposed project includes riprapping the north bank of the Sawyer River to address erosion that occurred during Hurricane Irene and to prevent additional bank erosion.

(12) The benefit of a project to the health, safety, and well being of the general public;

The project will improve public safety by providing a safer permanent bridge. The roadway approaches to the bridge will have better highway geometrics than the temporary bridge.

(13) The impact of a proposed project on quantity or quality of surface and ground water.

Because of its location in the White Mountain National Forest, the Sawyer River is an Outstanding Resource Water (ORW), which provides it protection from degradation to water quality through RSA 485-A and Env-Wq 1700. Under the rules (Env-Wq 1700),

(b) Water quality shall be maintained and protected in surface waters that constitute ORW, except that some limited point and nonpoint source discharges may be allowed providing that they are of limited activity which results in no more than temporary and short-term changes in water quality. "Temporary and short term" means that degradation is limited to the shortest possible time. Such activities shall not permanently degrade water quality or result at any time in water quality lower than that necessary to protect the existing and designated uses in the ORW. Such temporary and short term degradation shall only be allowed after all practical means of minimizing such degradation are implemented.

It is anticipated that the bridge replacement will not incur any degradation of surface or groundwater quality. All appropriate BMPs will be used during construction to prevent degradation of the river.

(14) The potential of a proposed project to cause or increase flooding, erosion, or sedimentation;

The project has been designed to minimize flooding, erosion, and sedimentation. The proposed bridge has a wider span, 135 feet, as compared with the existing 95 feet. Scour stone will be installed around the footings to protect them against the predicted flows under the bridge. The north bank of the river, which was severely eroded during the rain events of August 2011, will be protected with Class B riprap to minimize further erosion of the bank.

(15) The extent to which a project that is located in surface waters reflects or redirects current or wave energy which might cause damage or hazards;

The river migrated slightly northward as a result of the high flows during the storm. The expansion of the bridge span is intended to accommodate the redirection of the current energy caused by this migration.

(16) The cumulative impact that would result if all parties owning or abutting a portion of the affected wetland or wetland complex were also permitted alterations to the wetland proportional to the extent of their property rights.

As described above, the Sawyer River bridge and roadway lie entirely within the WMNF. It is unlikely that another bridge would be built in the immediate vicinity, but if it were, there would be additional impacts to riparian areas due to tree removal and habitat disruption, and temporary impacts to the river channel.

(17) The impact of the proposed project on the values and functions of the total wetland or wetland complex;

The construction of the replacement bridge is not anticipated to create any permanent impacts to the functions and values of the river. Impacts to wildlife have been minimized to the extent possible through the channel substrate design, and all appropriate measures will be taken during construction to minimize erosion and sedimentation. Construction timing will accommodate fisheries concerns.

(18) The impact upon the value of the sites included in the latest published edition of the National Register of Natural Landmarks, or sites eligible for such publication;

The river lies within the WMNF, but is not on the National Register of Natural Landmarks.

(19) The impact upon the value of areas named in acts of congress or presidential proclamations as national rivers, national wilderness areas, national lakeshores, and such areas as may be established under federal, state, or municipal laws for similar and related purposes such as estuarine and marine sanctuaries; and

NA

(20) The degree to which a project redirects water from one watershed to another.

NA

Env-Wt 404 Criteria for Shoreline Stabilization

The Sawyer River bridge replacement proposes stone fill on the banks and within the stream channel as depicted on the attached plans. Pursuant to PART Wt 404 Criteria for Shoreline Stabilization, the following addresses each codified section of the Administrative Rules:

Wt 404.01 Least Intrusive Method

The riverbank stabilization treatment proposed is the least intrusive construction method necessary to minimize the disruption to the existing shorelines. The stone treatment can be reasonably constructed utilizing general highway construction methods. Because of the potential erosive forces of the Sawyer River, other less intrusive methods are not available to use.

Wt 404.02 Diversion of Water

The river will be temporarily diverted during construction as depicted on the attached plans. The proposed bridge accommodates the lateral migration that has occurred in the Sawyer River and allows for additional lateral migration.

Wt 404.03 Vegetative Stabilization

Natural vegetation will be left undisturbed to the maximum extent possible. Vegetative stabilization techniques to stabilize the riverbanks are not available because of the highly erosive nature of the Sawyer River. The attached Sawyer River Preliminary Hydraulic Summary provides substantiation for the stone specifications required for stabilization of the bank and streambed to protect the proposed bridge abutments.

Wt 404.04 Rip-Rap

(a) Stone fill, as proposed, is shown on the attached Bridge Plan Sheet "Siteplan and Profile" (sheet 2 of 3) to protect the new abutments and along the channel and bank. Stable banks are necessary to maintain the structural integrity of the structure during all flow conditions.

(1-5) The attached Hydraulic Summary provides the riprap sizing and limits required for scour countermeasures at the Sawyer River bridge. The stone is sized at D_{50} 3.4, and will be placed at a thickness of 5.1 feet.

(6) The attached plan sheets indicate the relationship of the project to fixed points of reference, abutting properties, and features of the natural shoreline.

(7) The attached Hydraulic Summary provides an analysis of the anticipated scour and provides substantiation for the recommended stone stabilization methods.

(c) NA

(d) Stone fill is proposed to prevent possible undermining of the slopes.

(e) Conceptual level engineering plans are being provided as a part of the application for rip-rap in excess of 100 linear feet along the stream bank. As a Design-Build project, final stamped plans will not be available until after the advertisement of the project, and these will be forwarded by the selected Design-Builder to the Wetlands Bureau at that time.

Wt 404.05 Walls

NA

Stream Rules

The Sawyer River has a watershed measuring 23.6 square miles, and as such, the bridge is a Tier 3 crossing. Proposals for Tier 3 stream crossings are required to follow Administrative Rules Env-Wt 904 et seq. Compliance with these rules is detailed below.

Env-Wt 904.01 General Design Considerations.

All stream crossings shall be designed and constructed so as to:

(a) Not be a barrier to sediment transport;

The proposed replacement bridge will provide a larger opening than the existing bridge, which also facilitated sediment transport. The bridge will not impose a barrier to sediment transport.

(b) Prevent the restriction of high flows and maintain existing low flows

The proposed Abutment B has been located in a similar location to the existing Abutment B. The proposed Abutment A has been set back 45 feet from the existing Abutment A to accommodate additional lateral stream migration. The proposed bridge has been designed to pass the 100 year storm with one foot of freeboard.

The NH stream crossing guidelines provide that the crossing should be the bankfull width x the entrenchment ratio. The bankfull width is 60', and the entrenchment ratio is 2.3. The ideal crossing width using this method is calculated to be 138'. As described above, the 135' span is the widest that can be constructed that can accommodate the roadway geometry and that won't interfere with the temporary bridge.

Low flows will be maintained by ensuring that elevation of the stream substrate under the bridge ties into the stream substrate upstream and downstream of the bridge. The design will include a low flow channel that includes 12" of natural stream bed material to be placed over the proposed stone channel protection allowing passage of aquatic organisms during low flow conditions.

(c) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;

Aquatic organisms in the river will be able to move unobstructed under the bridge.

(d) Not cause an increase in the frequency of flooding or overtopping of banks;

The bridge will not cause an increase in the frequency of flooding or overtopping the banks. Events such as the one that occurred in August, where the south bank of the river upstream of the bridge was overtopped, were not caused or affected by the presence of the bridge.

(e) Preserve watercourse connectivity where it currently exists;

Watercourse connectivity will be maintained during and after construction. Water diversion methods used during bridge construction may cause brief interruptions in connectivity.

(f) Restore watercourse connectivity where:

(1) Connectivity previously was disrupted as a result of human activity(ies); and

(2) Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;

NA

(g) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and

A hydraulic analysis of the crossing was performed that showed that to protect the abutments from future scour, Class B riprap will be installed at a depth of 5.1 feet. To accommodate aquatic organism passage and create a more natural streambed, the areas next to the abutments will be excavated to a depth of 6 feet, with an additional 1 foot of stockpiled streambed material to be placed on top of the scour stone.

(h) Not cause water quality degradation.

All appropriate measures will be taken during construction to prevent degradation of water quality in the river.

Env-Wt 904.05 Design Criteria for Tier 2 and Tier 3 Stream Crossings.

New and replacement tier 3 stream crossings shall be designed and constructed:

(a) In accordance with the NH Stream Crossing Guidelines

The Guidelines (in particular, Section IV, Guidelines for Stream Crossing Structure Replacement) have been followed to the extent practicable. In accordance with the Guidelines, the proposed bridge has been designed to avoid or mitigate the following problems:

Inlet drops NA

Outlet drops NA

Flow contraction that produces significant turbulence and increased velocities NA. The hydraulic analysis showed that contraction scour, or scouring due to the constriction of flow as it passes under the bridge did not contribute to the erosion that occurred during Hurricane Irene. The substructure failure was instead caused by lateral stream migration.

Tailwater armoring NA

Tailwater scour pools NA

Headwater pools NA

Headwater flooding NA

Physical barriers to aquatic organism passage

Aquatic organism passage has been addressed in the design of the scour stone to be placed around the bridge abutments. As described previously, the scour stone will be top-dressed with one foot of natural streambed material.

Embankment failures/instabilities

Where erosion occurred on the north bank of the river, the bank will be armored with stone to protect against future erosion.

Channel entrenchment

Channel entrenchment and lateral migration are not due to the presence of the bridge, and are anticipated to continue. Entrenchment that occurred during the storm of August 2011 will self mitigate as the stream deposits sediment in the entrenched channel.

Channel sedimentation NA

(b) With the bed forms and streambed characteristics necessary to cause water depths and velocities within the crossing structure at a variety of flows to be comparable to those found in the natural channel upstream and downstream of the stream crossing;

Water depths and velocities within the crossing structure have been addressed by designing the channel substrate material and elevation underneath the structure to match the upstream and downstream stretches of the river.

(c) To provide a vegetated bank on both sides of the watercourse to allow for wildlife passage;

The low banks of the Sawyer River are rocky, and the low flow channel is within these banks. There will not be a vegetated bank under the structure because of the large amount of stone that must be used for scour protection.

(d) To preserve the natural alignment and gradient of the stream channel, so as to accommodate natural flow regimes and the functioning of the natural floodplain;

There will be no impact to the alignment of the stream or to the gradient of the stream channel. Scour stone to be placed around the bridge abutments will match the elevations of the existing stream channel.

(e) To accommodate the 100-year frequency flood, to ensure that:

(1) There is no increase in flood stages on abutting properties; and

(2) Flow and sediment transport characteristics will not be affected in a manner which could adversely affect channel stability;

The proposed bridge has been designed to accommodate the 100-year flood. The bridge will not affect flood storage behind the roadway, which was and is almost non-existent. Effects to the wooded areas adjacent to the river, where a large amount of gravel and boulders were deposited during the storm, were not due to the presence of the bridge.

(f) To simulate a natural stream channel; and

As described above, stream substrate under the bridge will be top-dressed with stockpiled natural streambed material excavated from the same location.

(g) So as not to alter sediment transport competence.

No effect to sediment transport competence is anticipated.

Mitigation

As a Tier 3 stream crossing replacement, the project qualifies as a major impact. Major impacts by rule require compensatory mitigation. The wetland impacts that are proposed for the project are either temporary in nature (excavation for the bridge footings and scour stone) or permanent impacts for infrastructure protection. Therefore, in accordance with Env-Wt 302.03 (b) and Env-Wt 302.03(c)(2)c, mitigation is not required.

Mitigation

As a Tier 3 stream crossing replacement, the project qualifies as a major impact. Major impacts by rule require compensatory mitigation. The wetland impacts that are proposed for the project are either temporary in nature (excavation for the bridge footings and scour stone) or permanent impacts for infrastructure protection. Therefore, in accordance with Env-Wt 302.03 (b) and Env-Wt 302.03(c)(2)c, mitigation is not required.

**U.S. Army Corps of Engineers
New Hampshire Programmatic General Permit (PGP)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)**

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to “work” include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See PGP, GC 5 regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*		x
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	x	
2.2 Are there proposed impacts to SAS, shellfish beds, special wetlands and vernal pools (see PGP, GC 26 and Appendix A)? Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) website, www.nhnaturalheritage.org , specifically the book Natural Community Systems of New Hampshire .		x
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	x	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)	x	
2.5 The overall project site is more than 40 acres.		x
2.6 What is the size of the existing impervious surface area?	66,174	
2.7 What is the size of the proposed impervious surface area?	67,762	
2.8 What is the % of the impervious area (new and existing) to the overall project site?	28% ex, 29% prop	
3. Wildlife	Yes	No
3.1 Has the NHB determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require a NHB determination.)	x	
3.2 Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”? (These areas are colored magenta and green, respectively, on NH Fish and Game’s map, “2010 Highest Ranked Wildlife Habitat by Ecological Condition.”) Map information can be found at: <ul style="list-style-type: none"> • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm. • Data Mapper: www.granit.unh.edu. • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html. 	x	
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		x
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		x
3.5 Are stream crossings designed in accordance with the PGP, GC 21?	x	

4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?		x
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?		
5. Historic/Archaeological Resources		
If a minor or major impact project, has a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) been sent to the NH Division of Historical Resources as required on Page 5 of the PGP?	x	

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.

Army Corps of Engineers Supplemental Checklist

2. Wetlands

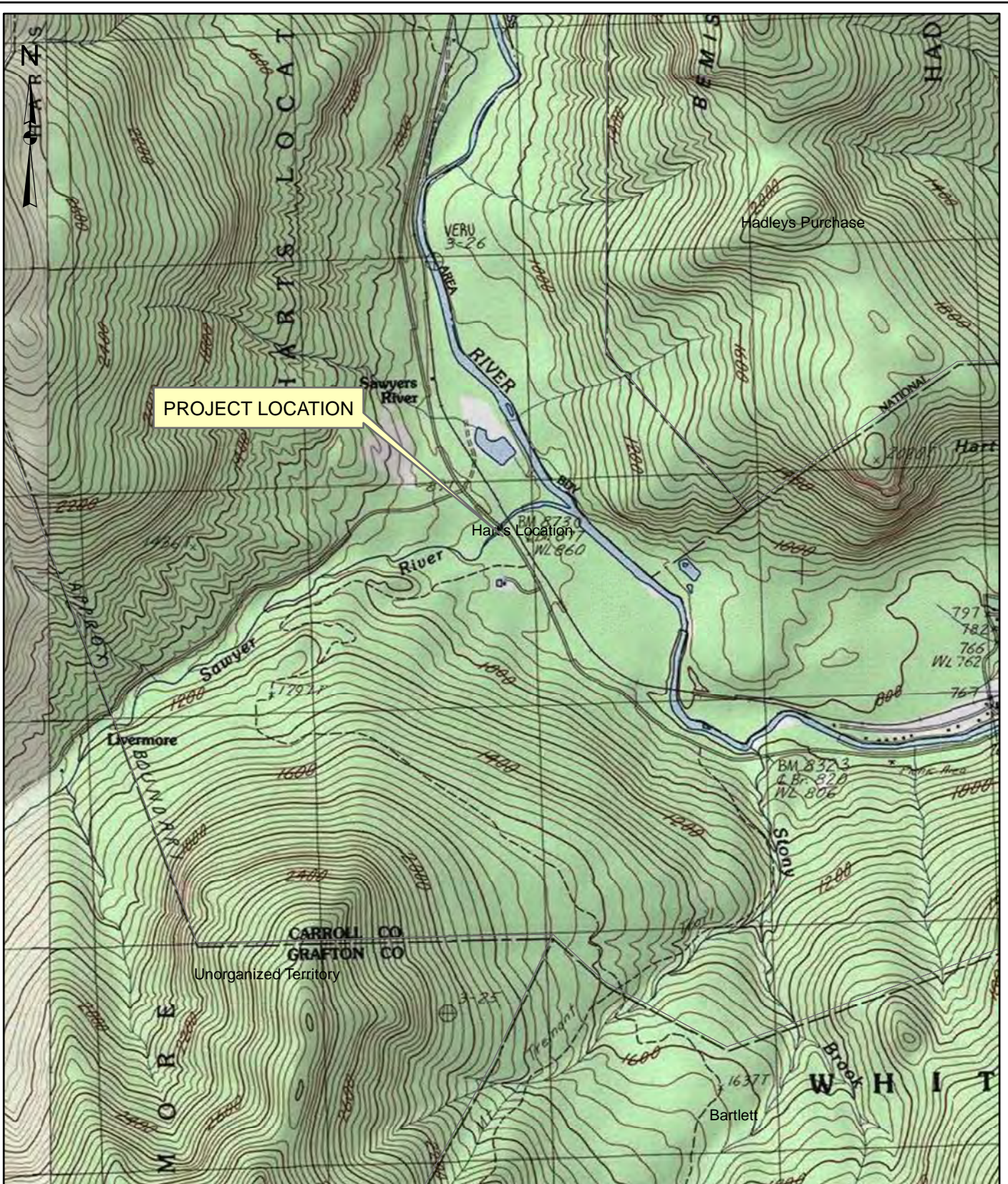
2.1 The proposed work involves a crossing of the Sawyer River, a perennial stream.

2.4 The project will involve some vegetation removal in order to access the bridge and install the necessary scour stone. Because the project will be built as a Design-Build project, Limits of tree clearing have not yet been determined and will be determined by the contractor.

3. Wildlife

3.1 A letter was received from the New Hampshire Natural Heritage Inventory indicating that although a rare species was known to be present in the vicinity of the project, no impact to the species was anticipated from the proposed work.

3.2 The Sawyer River is identified as Tier 1, "Top ranked in New Hampshire" on the 2010 Wildlife Action Plan map.



NHDOT 16396A

HARTS LOCATION

US ROUTE 302 OVER THE SAWYER RIVER

SCALE :

1:24,000

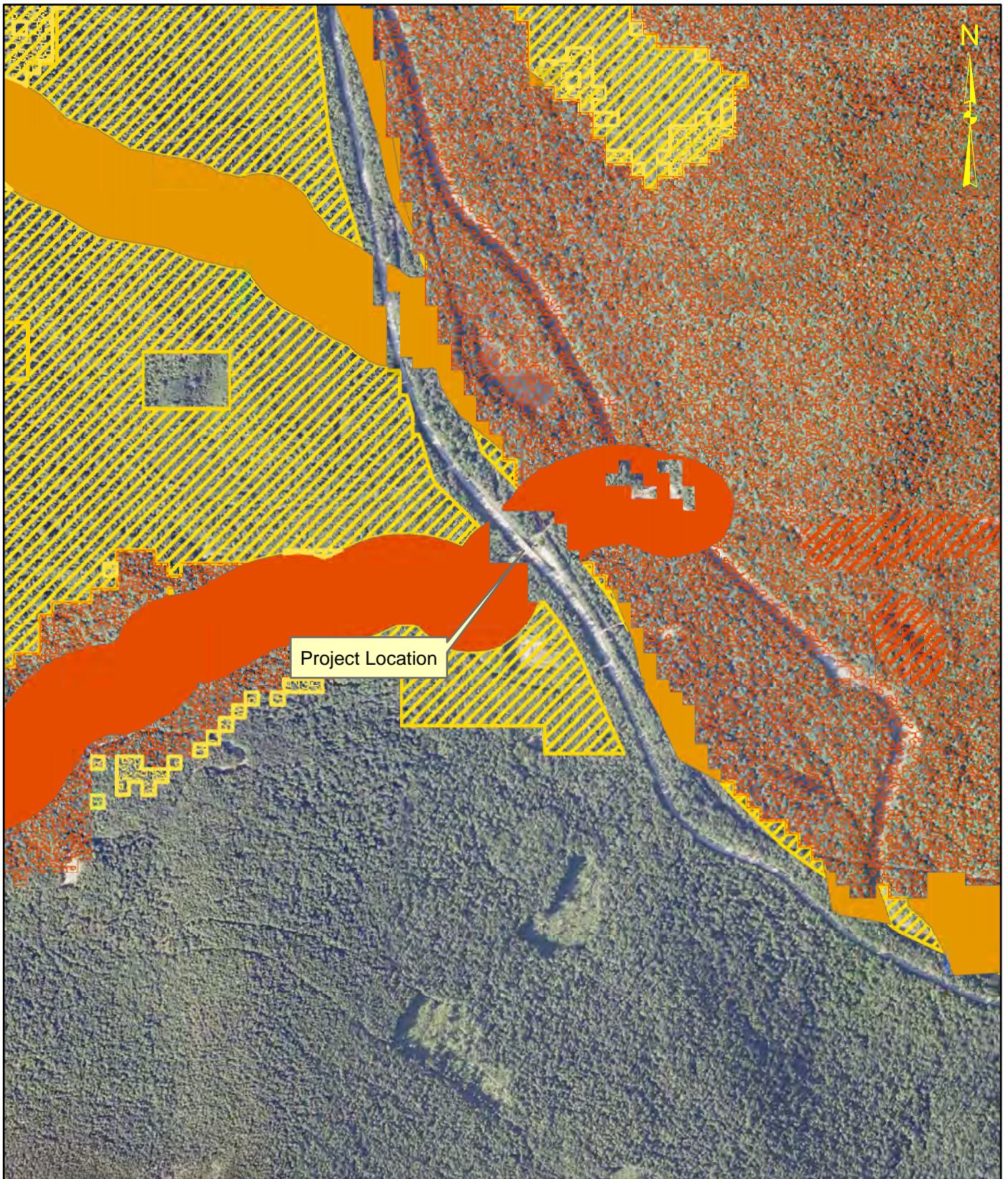
DATE :

JANUARY 2012












FIGURE :

LOCUS





2010 Wildlife Action Plan Tiers

- | | |
|---|--|
|  Tier 1 EO addin |  Tier 2 Top-ranked in wsgroup |
|  Tier 1 EO elevated |  Tier 3 |
|  Tier 1 Matrix forest |  Tier 3 Matrix forest |
|  Tier 1 Top-ranked in NH |  Tier 3 NHB elevated |
|  Tier 2 Matrix forest |  Tier 3 Supporting Landscape |
|  Tier 2 Top-ranked in region | |

NHDOT 16396A

HARTS LOCATION

**US ROUTE 302
OVER THE SAWYER RIVER**

SCALE :

1:12,000

DATE :

JANUARY 2012

FIGURE :

WILDLIFE HABITAT





NHDOT 16396A

HARTS LOCATION

US ROUTE 302
OVER THE SAWYER RIVER

SCALE :

1:96,000

DATE :

FEBRUARY 2012

FIGURE :

WATERSHED

Watershed mapped using USGS Streamstats program
http://water.usgs.gov/osw/streamstats/new_hampshire.html

 **McFarland Johnson**



1. Aerial view of damaged bridge, temporary bridge, and railroad bridge. View East.
(Date uncertain)



2. Sawyer River, view upstream (southwest) (September 21, 2011)



3. Damaged bridge deck, view south from north bank. (September 21, 2011)



4. Bridge deck damage after August 30 storm (September 4, 2011)



5. Bank erosion, north bank, view upstream (September 21, 2011)



6. View northeast of damaged bridge. (September 21, 2011)



7. Floodplain on south side of river, with material deposited during high flows.
(September 21, 2011)



8. Upstream of bridge, north bank of river, showing erosion caused by the August 30 2011 storm.
(September 21, 2011)

Vicki Chase - RE: Sawyer River Bridge, Hart's Location

From: John A Magee <john.a.magee@wildlife.nh.gov>
To: Vicki Chase <vchase@mjinc.com>
Date: 2/2/2012 8:46 AM
Subject: RE: Sawyer River Bridge, Hart's Location
CC: "Timmins, Dianne" <Dianne.Timmins@wildlife.nh.gov>

Oh, I am glad you asked. To minimize the impact to migrating and spawning trout and also to any trout eggs that may be in the River, it would be best to have no instream construction between September 1 and April 1. If that is not going to be practicable, then I would suggest no instream work between September 1 and October 15 to minimize the impact to migrating trout (they migrate during that time period to spawn).

John

John Magee
 Fish Habitat Biologist
 New Hampshire Fish and Game Department
 11 Hazen Drive
 Concord, NH 03301
 p (603) 271-2744
 f (603) 271-1438
john.a.magee@wildlife.nh.gov

From: Vicki Chase [<mailto:vchase@mjinc.com>]
Sent: Thursday, February 02, 2012 8:39 AM
To: John A Magee
Subject: RE: Sawyer River Bridge, Hart's Location

Hi John, will do. I will also print it and submit with the wetland application.

Did you have any further thoughts about conditions for timing of construction?

Vicki Chase • Environmental Analyst • Environmental
 53 Regional Drive • Concord, NH 03301
 Office: 603-225-2978 •

>>> John A Magee <john.a.magee@wildlife.nh.gov> 2/2/2012 8:36 AM >>>

Hi Vicki. That sounds reasonable to me. I hope the River doesn't move so much in the future that it impacts the bridge.

Please send this email chain to the wetlands inspector and cc me.

John

John Magee
Fish Habitat Biologist
New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301
p (603) 271-2744
f (603) 271-1438
john.a.magee@wildlife.nh.gov

From: Vicki Chase [mailto:vchase@mjinc.com]
Sent: Tuesday, January 31, 2012 1:33 PM
To: John A Magee
Subject: RE: Sawyer River Bridge, Hart's Location

Hi John,

I asked our bridge engineer this question, and his response is that the bridge is likely to have another northward migration within the bridge's service life. The bridge span extension from 95' to 135' is intended to accommodate that migration, along with deeper bridge foundations.

The bridge location is close to the mouth of the Saco River. As you can see on the USGS topo, the terrain starts to level out as it approaches the Saco. I do not have a profile for the river, but the bridge is likely at a point where sediment is deposited from upstream as the terrain levels out. So, while the permanent long term stability of the river is not a certainty, the proposed bridge accommodates that uncertainty to the extent possible and practicable.

Vicki

What do you think the possibility of another northward migration of the river (or any lateral migration of the river) is during another storm? My sense (listening to a number of fish biologist and geomorphologists) is that many White Mountain rivers have HUGE sediment loads and therefore they have a tendency to migrate laterally pretty easily. That would be my biggest concern with rebuilding the bridge. Also, if the site is a place where sediment deposition tends to occur, that makes the river more prone to lateral migration.

John Magee
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New Hampshire Fish and Game Department
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Concord, NH 03301
p (603) 271-2744
f (603) 271-1438
john.a.magee@wildlife.nh.gov

From: Vicki Chase [mailto:vchase@mjinc.com]
Sent: Tuesday, January 31, 2012 10:45 AM
To: John A Magee
Subject: RE: Sawyer River Bridge, Hart's Location

Thanks John.

The bridge failure was related to the northward migration of the river during the rain event. The replacement bridge is proposed to have a span of 135 feet, replacing a 95 foot span of the damaged bridge. The 135 foot span is the longest possible given the goal of keeping the temporary bridge open during construction (a longer span would run into the temporary bridge). Bankfull width just upstream of the bridge is 70 feet, using HEC-RAS to calculate the water elevation for a 1.5 year storm.

The elevation of the stream substrate under the bridge will match the elevation and slope upstream and downstream of the bridge.

I am trying to get information from USGS on what the recurrence interval of the storm was at this location. As I am sure you know, in Vermont it was estimated to be over the 100 year.

Vicki

Vicki Chase • Environmental Analyst • Environmental
53 Regional Drive • Concord, NH 03301
Office: 603-225-2978 •

Vicki Chase • Environmental Analyst • Environmental
53 Regional Drive • Concord, NH 03301
Office: 603-225-2978 •

>>> John A Magee <john.a.magee@wildlife.nh.gov> 1/31/2012 8:34 AM >>>

Hi Vicki. I don't know this site well, and I have not been involved with discussions about the bridge replacement. However, I will offer the following thoughts:

- 1) I think it is very important to know why (i.e., the fluvial mechanisms) the bridge failed during Irene, and specifically address them in the design. If sediment transport led the failure during the flood, then that should be addressed. This will lead to a better long-term solution.
- 2) Stream substrate and elevation: is the elevation of the substrate under the bridge influenced by the bridge (existing or proposed bridge)? If so, then that needs to be addressed in the design. You don't want to place the substrate at an elevation that will ultimately influence sediment transport at the site, potentially leading to bridge failure in the future.
- 3) If its natural substrate under the proposed bridge, I suspect it will be passable by aquatic organisms.

I don't know what fish species are there, so with this email, I ask Dianne Timmins (cc'd here) to supply a list of fish species in the Sawyer River (or the Saco since it is right next to the bridge in question) by replying to all.

Thank you for contacting me.

John

John Magee
Fish Habitat Biologist
New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301
p (603) 271-2744
f (603) 271-1438
john.a.magee@wildlife.nh.gov

From: Vicki Chase [mailto:vchase@mjinc.com]
Sent: Monday, January 30, 2012 3:49 PM
To: John A Magee
Subject: Sawyer River Bridge, Hart's Location

John,

McFarland Johnson is assisting NHDOT with engineering services and permitting for the replacement of the Sawyer River Bridge in Hart's Location. As you may know, this bridge was irreparably damaged from the heavy flows during the rain from hurricane Irene on August 30, 2011. A temporary bridge was installed following the event, on September 17, next to the damaged bridge. A permanent bridge is proposed to be constructed in the location of the damaged bridge. The bridge is proposed to be built using the Design Build project, with NHDOT providing preliminary designs and permits to the design engineers.

Attached is an aerial photograph and USGS topo map depicting the bridge location. The aerial depicts the damaged bridge and the temporary bridge.

We are requesting your guidance in any fisheries concerns or constraints regarding the bridge replacement. The project was presented at the January 18 natural resource meeting at NHDOT, and concerns expressed during that meeting are being addressed in the bridge design. (The stream substrate elevation will match the existing elevation, and natural streambed material will be used to top dress the areas to be protected with Class B ripap).

Thanks for your attention. Please let me know if you have any questions.

Vicki Chase • Environmental Analyst • Environmental
53 Regional Drive • Concord, NH 03301
Office: 603-225-2978 •



NEW HAMPSHIRE NATURAL HERITAGE BUREAU
NHB DATACheck RESULTS LETTER

To: Kevin Nyhan, NH Department of Transportation
PO Box 483, 7 Hazen Drive

Concord, NH 03303-0483

From: NH Natural Heritage Bureau

Date: 11/22/2011 (valid for one year from this date)

Re: Review by NH Natural Heritage Bureau of request submitted 9/6/2011

NHB File ID: NHB11-1845

Applicant: Kevin Nyhan

Location: Harts Location
US Route 302 over Sawyer River

Project Description: EMERGENCY replacement of bridge no. 235/059 (US Route 302 over Sawyer River). A temporary bridge is currently in use.

The NH Natural Heritage database has been checked by staff of the NH Natural Heritage Bureau and/or the NH Nongame and Endangered Species Program for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government.

It was determined that, although there was a NHB record (e.g., rare wildlife, plant, and/or natural community) present in the vicinity, we do not expect that it will be impacted by the proposed project. This determination was made based on the project information submitted via the NHB Datacheck Tool on 9/6/2011, and cannot be used for any other project.



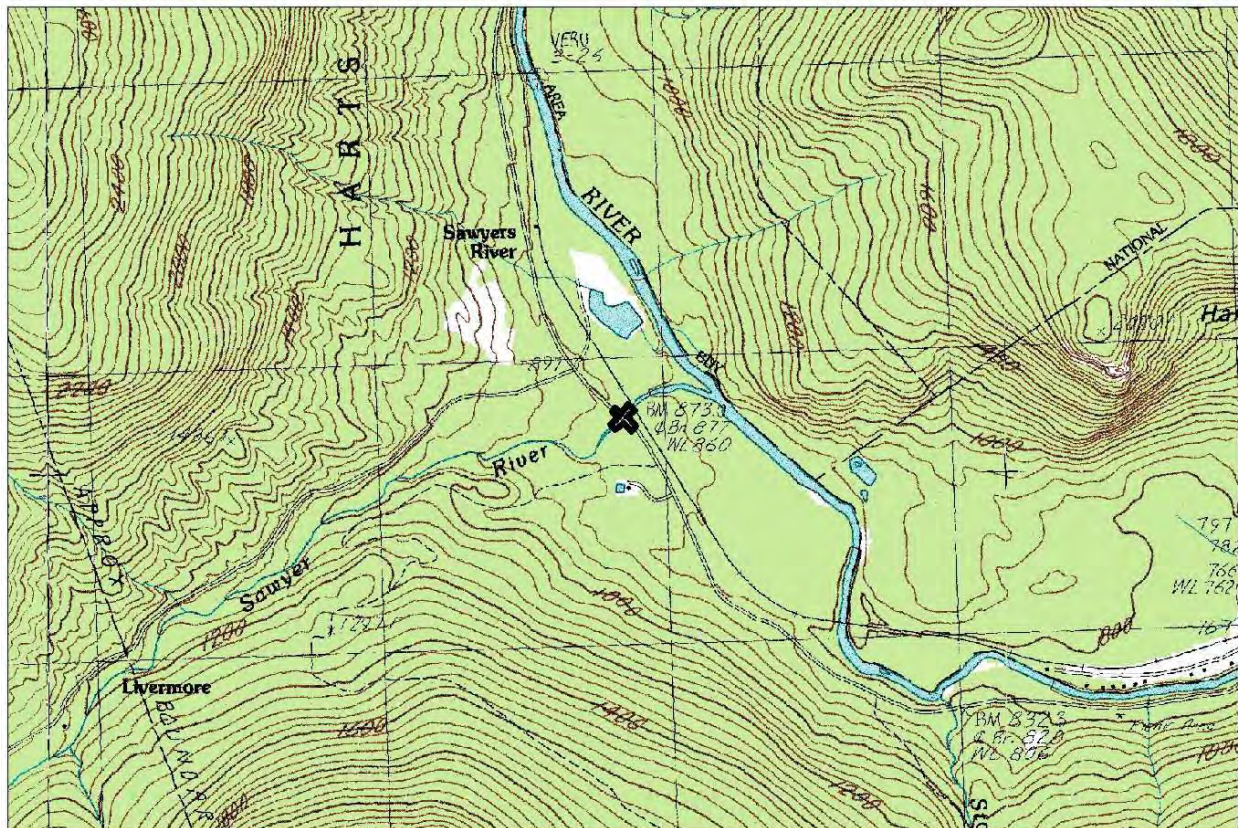
NEW HAMPSHIRE NATURAL HERITAGE BUREAU
NHB DATACheck RESULTS LETTER

MAP OF PROJECT BOUNDARIES FOR: **NHB11-1845**

NHB11-1845



NH NATURAL HERITAGE BUREAU



1:18000

Valid for one year from this date: 22 Nov 2011



MEMORANDUM

TO: Tom Kendrick, Project Manager
FROM: Melanie Haskins
DATE: 1/16/12
SUBJECT: Sawyer River Preliminary Hydraulic Summary
PROJECT NO.: 17513.05

☐ Urgent ☒ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

Preliminary Hydraulic Summary Harts Location – US Route 302 over Sawyer River State Project No. 16396A

1.0 Introduction

McFarland Johnson, Inc. performed preliminary hydrologic and hydraulic analyses for Bridge 235/059, carrying Route 302 over the Sawyer River in Harts Location, New Hampshire. The bridge foundations were partially undermined during Tropical Storm Irene and a new bridge is proposed.

2.0 Hydrology

Flows were determined using the TR-20 method, based on rainfall intensities from Carroll County – North. Although the majority of the watershed is located in northern Grafton County, the mountainous topography of the watershed is more closely related to the Carroll County-North region, which has some of the highest rainfall frequencies in the state.

The flows calculated are:

2- Year = 2,544 cfs
10-Year = 6,928 cfs
25-Year = 9,036 cfs
50-Year = 10,609 cfs
100-Year = 11,905 cfs

3.0 Hydraulic Analysis

The hydraulic analysis was performed using the HEC-RAS software program for supercritical flow. The calculated water surface elevations for the 50, 100, and 500 year storm events are summarized in the tables on pages A-4 and A-5.

4.0 Scour Assessment

a. Degradation Potential

Degradation is the vertical lowering of the channel that takes place over a long segment of the channel over a long time frame. Review of aerial and site photographs suggest that there may be evidence of vertical long term degradation as there are steepened banks along the low flow channel. Though there is an absence of inspection data which records a lowering trend in bed elevations, we have considered a minimum of one foot of degradation in the total scour estimate.

b. Lateral Migration Potential

Lateral migration is the side-to-side movement of the main channel within a floodplain which can undermine abutments. There is evidence of lateral movement of the outer channel banks.

c. Contraction Scour

Contraction scour is the general lowering of the streambed within the bridge opening waterway. It usually occurs over most or the entire bridge opening, and is the result of constrictions in the floodplain flow area caused by the bridge structure and roadway embankments. The contraction scour calculations were performed in accordance with FHWA HEC-18. The Sawyer River was determined to be operating in live-bed conditions for both the 100-year and 500-year flood events, as the velocities exceed the critical velocity for entraining sediment across the flow width. Despite the high velocities, the computed contraction scour depth was zero (0), which may be attributed to the significant expansion of the waterway opening of the proposed bridge, as well as the existing cobble and gravel channel material.

d. Abutment Scour

We understand that the NHDOT specifies abutment scour countermeasures in lieu of performing local abutment scour calculations, with the assumption that properly designed and installed abutment scour countermeasures can be reasonably expected to protect the abutments from local scour.

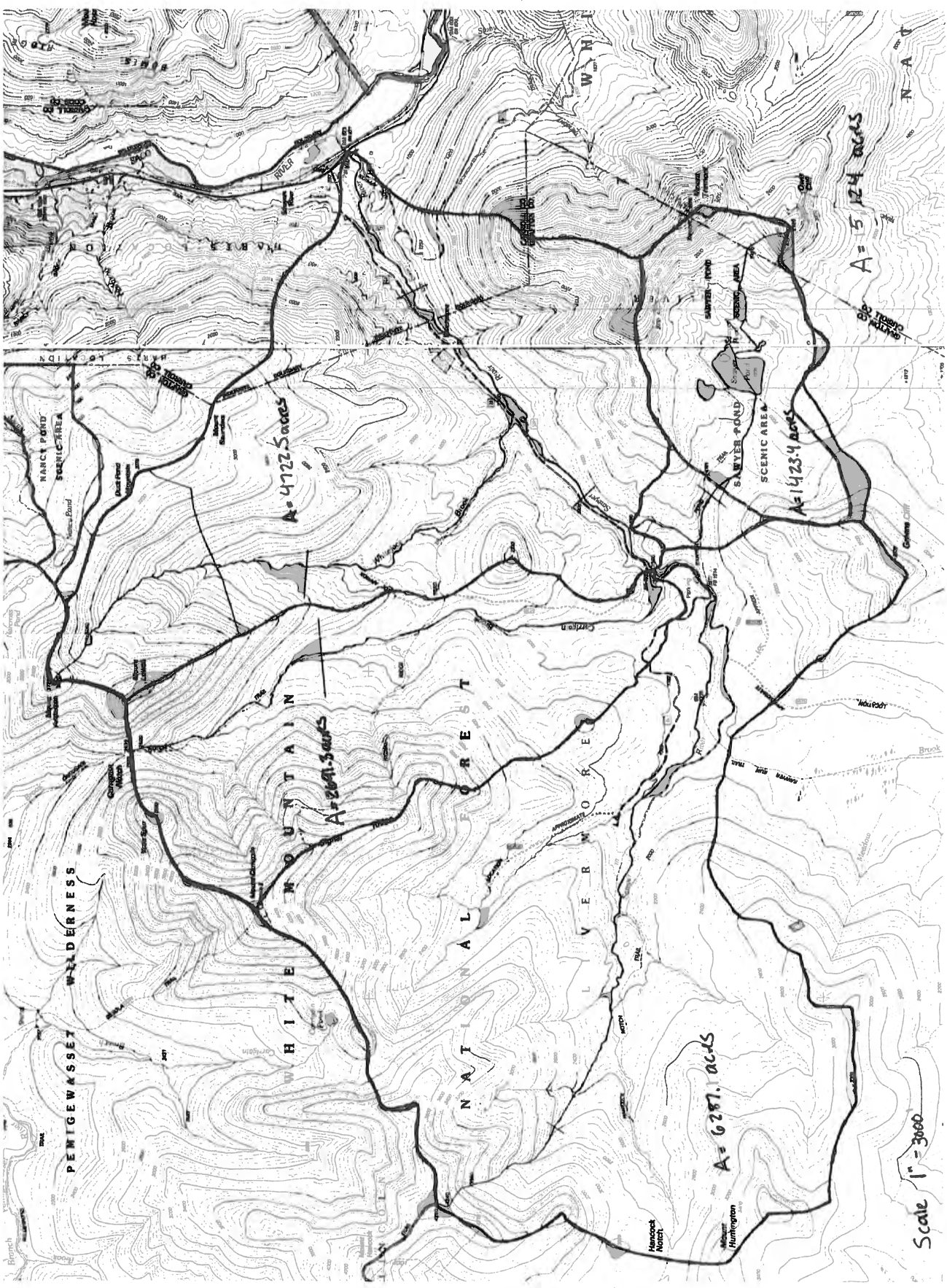
e. Total Potential Scour

Considering affects of potential degradation and lateral migration, it is recommended that the design incorporate one (1) foot of total channel scour. Given the evidence of the recent abutment and approach damage, it is recommended to set the bottom of abutment foundation seals a minimum of two (2) feet below the estimated channel scour. Using an existing bottom of channel elevation of 857.0 located on the downstream end, the bottom of proposed foundation seals should be constructed at or below elevation 854.0.

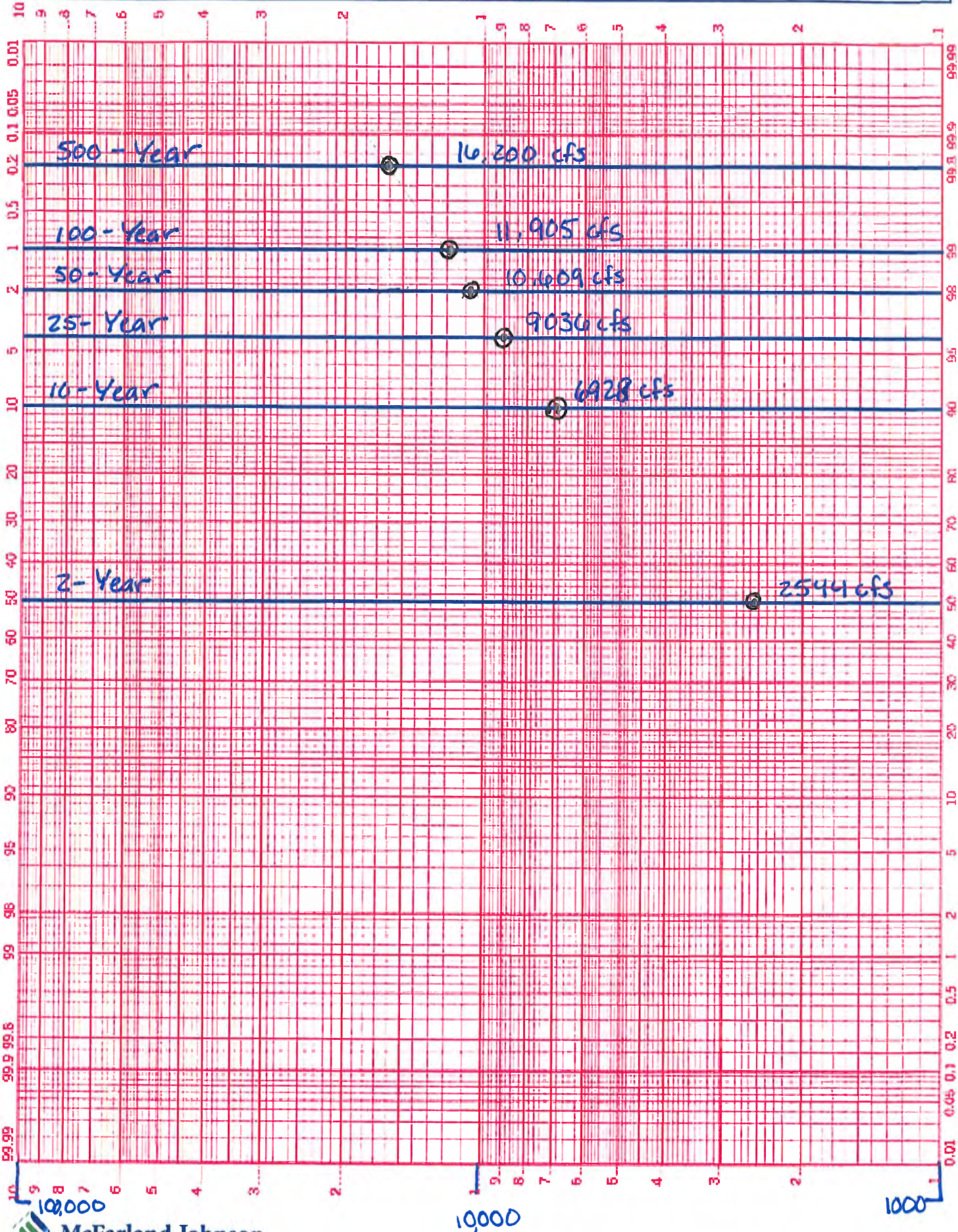
5.0 Preliminary Stone Fill (Riprap) Countermeasure

The stone fill (riprap) sizing and limits were established in accordance with guidance provided in FHWA HEC-23 and NHCRP Report 568 and based on the calculated controlling (100-year or 500-year) hydraulic conditions. The 500-year D_{50} calculation for the downstream end is the controlling size of 3.4 feet. A preliminary thickness of stone protection is determined by $1.5(D_{50}) = 5.1$ feet. See page A-6 for riprap size calculator. Per FHWA HEC-11, it is anticipated that long and deep riprap flanks will need to be incorporated into the project to adequately armor the abutments.

2

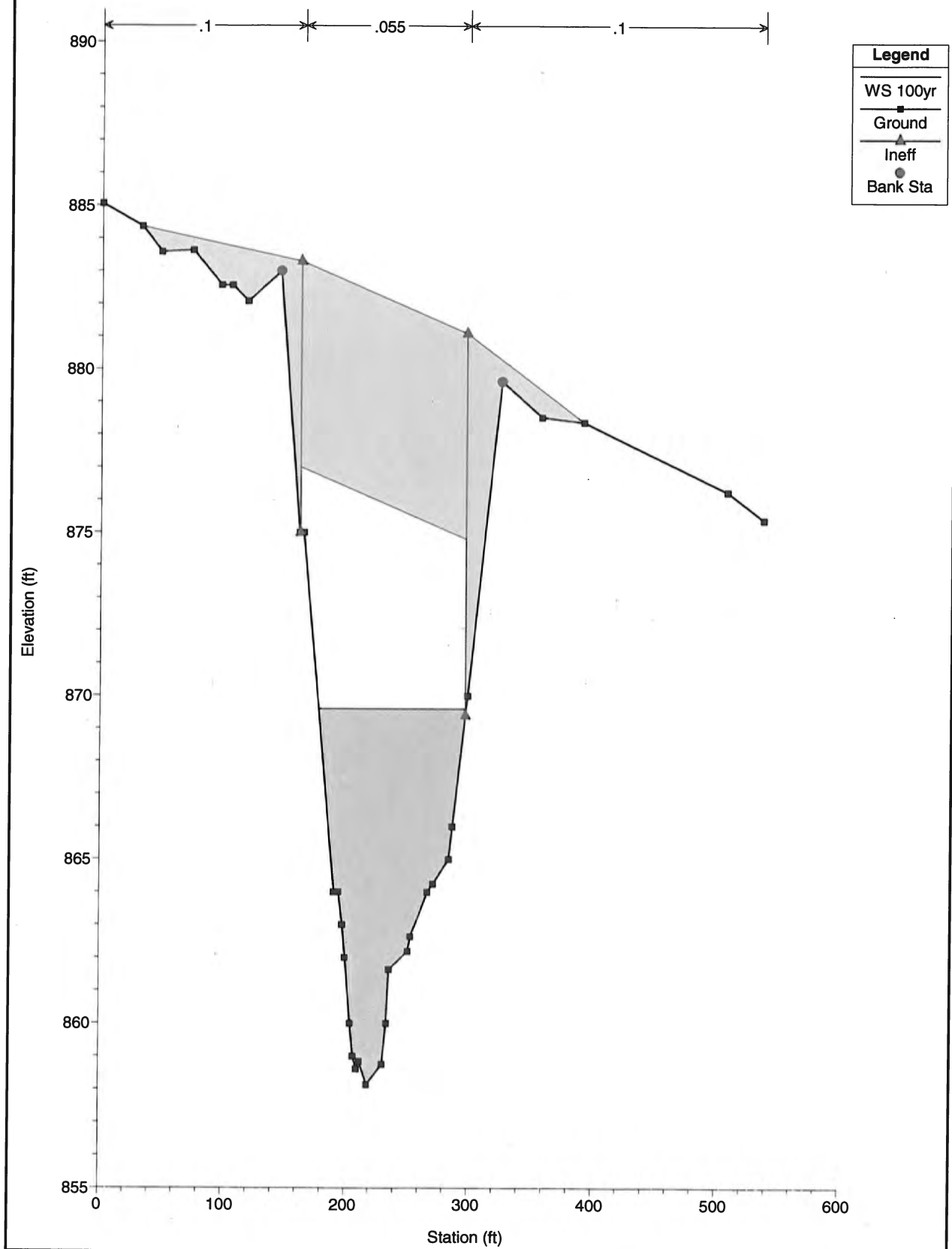


peak discharge = 2 cfs/cfs



McFarland Johnson

Sawyer River Plan: Plan 10 1/13/2012



Plan: Plan 10 Sawyer River Reach RS: 100356.6 Profile: 100yr

E.G. US. (ft)	872.96	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	869.60	E.G. Elev (ft)	872.96	871.92
Q Total (cfs)	11905.00	W.S. Elev (ft)	869.60	868.44
Q Bridge (cfs)	11905.00	Crit W.S. (ft)	869.60	868.54
Q Weir (cfs)		Max Chl Dpth (ft)	11.46	11.03
Weir Sta Lft (ft)		Vel Total (ft/s)	14.71	14.95
Weir Sta Rgt (ft)		Flow Area (sq ft)	809.05	796.11
Weir Submerg		Froude # Chl	1.00	1.02
Weir Max Depth (ft)		Specif Force (cu ft)	8738.18	8677.42
Min El Weir Flow (ft)	881.11	Hydr Depth (ft)	6.77	6.71
Min El Prs (ft)	877.00	W.P. Total (ft)	123.50	122.75
Delta EG (ft)	1.05	Conv. Total (cfs)	76526.3	74802.1
Delta WS (ft)	1.07	Top Width (ft)	119.59	118.59
BR Open Area (sq ft)	1610.07	Frctn Loss (ft)	0.08	1.14
BR Open Vel (ft/s)	14.95	C & E Loss (ft)	0.00	0.00
Coef of Q		Shear Total (lb/sq ft)	9.90	10.26
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

Plan: Plan 10 Sawyer River Reach RS: 100356.6 Profile: 500yr

E.G. US. (ft)	875.25	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	871.18	E.G. Elev (ft)	875.25	874.21
Q Total (cfs)	16200.00	W.S. Elev (ft)	871.20	870.07
Q Bridge (cfs)	16200.00	Crit W.S. (ft)	871.20	870.12
Q Weir (cfs)		Max Chl Dpth (ft)	13.06	12.66
Weir Sta Lft (ft)		Vel Total (ft/s)	16.16	16.33
Weir Sta Rgt (ft)		Flow Area (sq ft)	1002.61	991.77
Weir Submerg		Froude # Chl	1.00	1.01
Weir Max Depth (ft)		Specif Force (cu ft)	12869.77	12820.81
Min El Weir Flow (ft)	881.11	Hydr Depth (ft)	8.13	8.14
Min El Prs (ft)	877.00	W.P. Total (ft)	127.55	126.38
Delta EG (ft)	1.04	Conv. Total (cfs)	107085.6	105808.8
Delta WS (ft)	1.06	Top Width (ft)	123.32	121.85
BR Open Area (sq ft)	1610.07	Frctn Loss (ft)	0.08	1.08
BR Open Vel (ft/s)	16.33	C & E Loss (ft)	0.01	0.01
Coef of Q		Shear Total (lb/sq ft)	11.23	11.48
Br Sel Method	Energy only	Power Total (lb/ft s)	0.00	0.00

McFARLAND-JOHNSON, INC.

53 Regional Drive

Concord, New Hampshire 03301-8500

JOB: **Harts Location - Route 302 over Sawyer River**

SHEET NO.: _____ OF _____

BY: **MAH**DATE: **1/12/2012**CHECKED: **BMB**DATE: **1/13/2012**

M:\17513.05 Sawyer River Bridge\Design\Calcs\Hydraulics\Scour\57-109 RipRap Sawyer River.xlsx\Rip-Rap

**RIPRAP DESIGN - ABUTMENTS
SCOUR COUNTERMEASURES****DEFINITION OF TERMS****D50** = MEDIAN STONE DIAMETER, ft**V** = CHARACTERISTIC AVERAGE VELOCITY IN THE CONTRACTED SECTION**Ss** = 2.65 = SPECIFIC GRAVITY OF ROCK RIPRAP**g** = 32.2 = GRAVITATIONAL ACCELERATION, ft/s²**y** = DEPTH OF FLOW IN THE CONTRACTED BRIDGE OPENING**FORMULAE**

$$Fr = V/(gy)^{0.5}$$

FROUDE NUMBER

$$D50/y = K/(Ss-1)^{(V^2/gy)}$$

USE THIS WHEN FROUDE NUMBER IS ≤ 0.80 **K** = 0.89 FOR A SPILL -THROUGH ABUTMENT

0.89 FOR A VERTICAL WALL ABUTMENT

$$D50/y = K/(Ss-1)^{(V^2/gy)^{0.14}}$$

USE THIS WHEN FROUDE NUMBER IS > 0.80 **K** = 0.61 FOR A SPILL -THROUGH ABUTMENT**ASSUME:** 0.69 FOR A VERTICAL WALL ABUTMENT**SBR** = SET-BACK LENGTH/AVERAGE CHANNEL FLOW DEPTHSETBACK LENGTH IS THE DISTANCE FROM THE NEAR EDGE OF THE
MAIN CHANNEL TO THE TOE OF THE ABUTMENT**SET-BACK RATIO (SBR)**LEFT BANK

SETBACK LENGTH = 30 ft

AVERAGE DEPTH = 6.00 ft

SBR = 5.00 **SBR is = 5.0 based on calculations**RIGHT BANK

SETBACK LENGTH = 13 ft

AVERAGE DEPTH = 6.00 ft

SBR = 2.17 **SBR is < 5.0 based on calculations**

THEREFORE SINCE SBR IS EQUAL TO OR LESS THAN 5:

USE $V=Q/A$ FOR ENTIRE CONTRACTED BRIDGE OPENING

RIPRAP SIZE CALCULATION							
SECTION	Q (cfs)	A (sf)	V (ft/sec)	WSEL (ft)	y (ft)	Fr	MEDIAN STONE SIZE D ₅₀ (ft)
TITLE							
BR U	6928.00	544.23	12.73	867.28	5.05	1.00	2.11
	10609.00	744.06	14.26	869.05	6.34	1.00	2.65
	11905.00	809.05	14.71	869.60	6.77	1.00	2.83
	16200.00	1002.61	16.16	871.20	8.13	1.00	3.40
BR D	6928.00	540.49	12.82	866.15	5.08	1.00	2.13
	10609.00	734.85	14.44	867.92	6.49	1.00	2.71
	11905.00	796.11	14.95	868.44	6.71	1.02	2.82
	16200.00	991.77	16.33	870.07	8.14	1.01	3.41

Maximum D₅₀ (feet) = **3.41**RIP-RAP THICKNESS = 1.5 x D₅₀ = **5.12**

Cultural resource Memorandum of Effect
(Municipally Managed Projects)

Project Name: US Route 302 over Sawyer River

Date: February 9, 2012

State No.: 16396A

Federal No. (as applicable)

A001(289)

Pursuant to meetings on February 8, 2012, and for the purpose of compliance with the regulations of National Historic Preservation Act and the Advisory Council on Historic Preservation's *procedures for the Protection of Historic Properties* (36 CFR 800), the NH Division of Historical Resources and, when applicable, the NH Division of the Federal Highway Administration or the US Army Corps of Engineers have coordinated the identification and evaluation of cultural resources relative to (project description):

Harts Location 16396A US Route 302 over Sawyer River Bridge Replacement and Roadway Reconstruction Project involves the replacement of the existing Bridge (Br. No. #235/059) in the Town of Harts Location, with associated reconstruction of US Route 302 that was damaged by Hurricane Irene in August 2011. The road and bridge lie within the White Mountain National Forest (WMNF), and the entire watershed of the Sawyer River is within the WMNF. The US Route 302 reconstruction will begin approximately 300 feet north of the existing bridge and extend south to a point approximately 300 feet south of the existing bridge.

The Project includes minor vertical profile changes based on the new superstructure depth proposed by the Design Build team, drainage improvements, and waterway improvements. During construction, two lanes of traffic will be maintained on US Route 302 over the detoured alignment using the newly installed temporary bridge.

Route 302 was re-aligned in the early 1990's, and the existing bridge and surrounding area were reviewed by DHR. The project was found to have no impacts to historical or archaeological resources.

Based on a review of the project, as presented on this date, it has been determined that:

☒ **No Historic or Archaeological Properties will be Affected**
The 1926 abutment will be left in place when the temp bridge is removed.

☐ **There will be No Adverse Effect on Historic or Archaeological Properties**
Describe any outstanding commitments: _____

☐ **There will be an Adverse Effect on Historic or Archaeological Properties or Resources**
describe the effect, measures to minimize harm and proposed mitigation _____

(attach pages as Necessary).

There Will Be: ☒ No 4(f); ☐ Programmatic 4(f); ☐ Full 4 (f); ☐ A finding of de minimis impact as stated below:

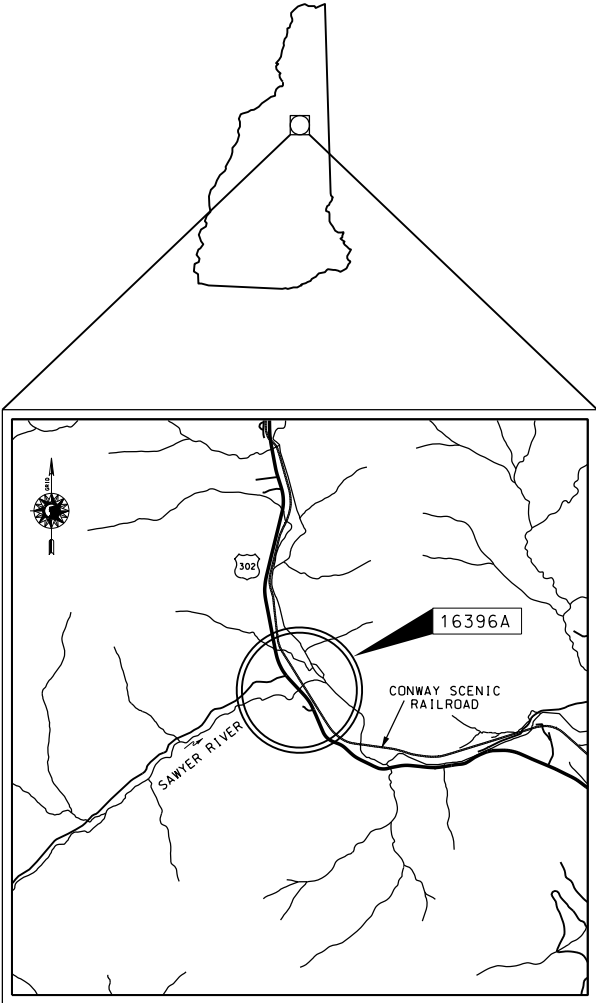
In addition, with NHDHR concurrence of no adverse effect for the above undertaking, and in accordance with Section 6009(a) of the 2005 SAFETEA-LU transportation program reauthorization, FHWA intends to, and by signature below, does make a finding of *de minimis* impact. NHDHR's signature below represents concurrence with both the no adverse effect determination and the de minimis findings. Parties to the Section 106 process have been consulted and their concerns have been taken into account. Therefore, the requirements of Section 4(f) have been satisfied

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
WETLANDS PLANS
FEDERAL AID PROJECT

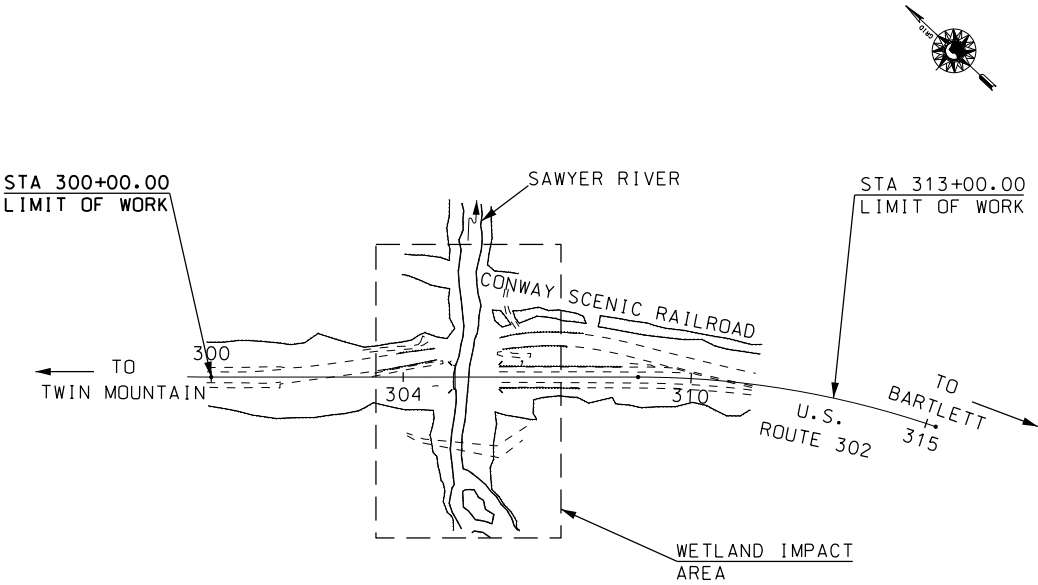
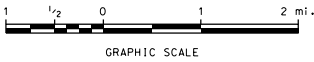
N.H. PROJECT NO. 16396A
U.S. ROUTE 302 OVER SAWYER RIVER

INDEX OF SHEETS

- 2-3 STANDARD SYMBOLS
- 4 WETLAND IMPACT PLAN
- 5 WATER DIVERSION AND EROSION CONTROL PLAN
- 6 PROFILE SAWYER RIVER
- 7 SAWYER RIVER CROSS SECTION
- 8 PROPOSED RIP-RAP CROSS SECTION



LOCATION MAP



TOWN OF HART'S LOCATION
COUNTY OF CARROLL

SCALE: 1" = 200'

FOR CONSTRUCTION DETAILS - SEE CONSTRUCTION PLANS

NHDOT THE STATE OF
NEW HAMPSHIRE
DEPARTMENT OF
TRANSPORTATION

RECOMMENDED FOR APPROVAL:

DIRECTOR OF PROJECT DEVELOPMENT _____ DATE _____
MUNICIPAL HIGHWAYS ENGINEER _____ DATE _____
BUREAU OF PLANNING AND COMMUNITY ASSISTANCE
APPROVED: _____
ASSISTANT COMMISSIONER AND CHIEF ENGINEER _____ DATE _____

U. S. DEPARTMENT OF
TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED: _____
DIVISION ADMINISTRATOR _____ DATE _____

FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
-	16396A	1	

DRAWN BY _____ DATE _____
CHECKED BY _____ DATE _____

GENERAL

EDGE OF PAVEMENT
TRAVELED WAY

PROPOSED ROADWAY

existing roadway

(pavement removed outside slope lines)

DRIVEWAYS

(label surface type)

BUILDINGS

(label house or type of building)

(building to be removed)

FOUNDATION

(label type)

LEACH FIELD

leach field

BRIDGE CROSSINGS

STREAM

OVERPASS

STEPS AND WALK

(label type)

INTERMITTENT WATER COURSE

SHORE LINE

river/stream

pond (label name of water body)

POTENTIAL WET AREA SYMBOL

BRUSH OR WOODS LINE

TREES (PLANS)

(deciduous)(coniferous) (stump)

(show station, circumference in feet & type)

TREE OR STUMP (CROSS-SECTIONS)

HEDGE

(label type)

MONITORING WELL

WELL

FLAG POLE

ORIGINAL GROUND (TYPICALS)

ROCK OUTCROP

ROCK LINE (TYPICALS & SECTIONS ONLY)

GUARDRAIL (LABEL TYPE)

JERSEY BARRIER

CURB (LABEL TYPE)

STONE WALL

RETAINING WALL (LABEL TYPE)

FENCE (LABEL TYPE)

SIGNS

(single post)

(double post)

GAS PUMP

FUEL TANK (ABOVE GROUND)

STORAGE TANK FILLER CAP

SEPTIC TANK

GRAVE

MAILBOX

VENT PIPE

SATELLITE DISH ANTENNA

PHONE

GROUND LIGHT/LAMP POST

BORING LOCATION

TEST PIT

INTERSTATE NUMBERED HIGHWAY

UNITED STATES NUMBERED HIGHWAY

STATE NUMBERED HIGHWAY

existing

PROPOSED

bgr

cgr

BGR

MEDIAN CGR

(points toward retained ground)

gp

ft (label size & type)

fc

gr

mb

vp

da

ph

gl

lp

B

TP

293

3

102

WETLANDS

WETLAND DESIGNATION AND TYPE

DELINEATED WETLAND

PRIME WETLAND

ORDINARY HIGH WATER

TOP OF BANK

TOP OF BANK & ORDINARY HIGH WATER

MEAN HIGH TIDE

TIDAL BUFFER ZONE

HIGHEST OBSERVABLE TIDAL LINE

SPECIAL AQUATIC SITE

VERNAL POOL

INVASIVE SPECIES LABEL

INVASIVE SPECIES

WATER FRONT BUFFER

NATURAL WOODLAND BUFFER

PROTECTED SHORE LAND

PUB2E

DW

PWET

OHW

T O B

T O B O H W

MHT

T B Z

H O T L

SAS

VP

I.S.

INV

WB50

NWB150

PS250

FLOODPLAIN / FLOODWAY

500 YEAR FLOODPLAIN BOUNDARY

100 YEAR FLOODPLAIN BOUNDARY

FLOODWAY

FP 500

FP 100

FW

ENGINEERING

CONSTRUCTION BASELINE

PC, PT, POT (ON CONST BASELINE)

PI (IN CONSTRUCTION BASELINES)

INTERSECTION OR EQUATION OF TWO LINES

ORIGINAL GROUND LINE (PROFILES AND CROSS-SECTIONS)

PROFILE GRADE LINE (PROFILES AND CROSS-SECTIONS)

CLEARING LINE

SLOPE LINE

SLOPE LINE (FILL)

SLOPE LINE (CUT)

PROFILES AND CROSS SECTIONS:

ORIGINAL GROUND ELEVATION (LEFT)

FINISHED GRADE ELEVATION (RIGHT)

12.5

19.14












SHEET 1 OF 2

STATE OF NEW HAMPSHIRE				
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN				
STANDARD SYMBOLS				
REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
10-25-11	----	16396A	2	---

DRAINAGE

MANHOLE				
CATCH BASIN		(existing)		(PROPOSED)
DROP INLET				
DRAINAGE PIPE (existing)			(label size & type)	
DRAINAGE PIPE (PROPOSED)				
UNDERDRAIN (existing) W/ FLUSHING BASIN				(label size & type)
UNDERDRAIN (PROPOSED) W/ FLUSHING BASIN				
HEADER (existing & PROPOSED)				(with stone outlet protection)
END SECTION (existing & PROPOSED)				METAL or PLASTIC
OPEN DITCH (PROPOSED)				
EROSION CONTROL/ STONE SLOPE PROTECTION				

BOUNDARIES / RIGHT-OF-WAY

	(label type)
RIGHT-OF-WAY LINE	_____
RR RIGHT-OF-WAY LINE	_____
PROPERTY LINE	_____P_____P_____
PROPERTY LINE (COMMON OWNER)	_____Z_____Z_____
TOWN LINE	_____BOW_____
	CONCORD
COUNTY LINE	_____COOS_____
	GRAFTON
STATE LINE	_____MAINE_____
	NEW HAMPSHIRE
NATIONAL FOREST	_____ . _____
LCHIP CONSERVATION EASEMENT	-----
BENCH MARK / SURVEY DISK	
BOUND	 bnd  (PROPOSED)
STATE LINE/ TOWN LINE MONUMENT	 S/L  T/L
NHDOT PROJECT MARKER	
IRON PIPE OR PIN	 ip
DRILL HOLE IN ROCK	 dh
TAX MAP AND LOT NUMBER	 1642/341 6.80 Ac. ±
PROPERTY PARCEL NUMBER	 12
HISTORIC PROPERTY	








UTILITIES

	existing	PROPOSED
TELEPHONE POLE		
POWER POLE		
JOINT OCCUPANCY		
MISCELLANEOUS/UNKNOWN POLE		
GUY POLE OR PUSH BRACE		
LIGHT POLE		
LIGHT ON POWER POLE		
LIGHT ON JOINT POLE		
POLE STATUS: REMOVE, LEAVE, PROPOSED, OR TEMPORARY AS APPLICABLE e.g.:		
RAILROAD		
RAILROAD SIGN		
RAILROAD SIGNAL		
UTILITY JUNCTION BOX		
OVERHEAD ELECTRIC		
UNDERGROUND UTILITIES		
WATER (on existing lines label size, type and note if abandoned)		
SEWER		
TELEPHONE		
ELECTRIC		
GAS		
LIGHTING		
INTELLIGENT TRANSPORTATION SYSTEM		
FIBER OPTIC		
WATER SHUT OFF		
GAS SHUT OFF		
HYDRANT		
MANHOLES		
SEWER		
TELEPHONE		
ELECTRICAL		
GAS		
UNKNOWN		

TRAFFIC SIGNALS

	EXISTING	PROPOSED
MAST ARM (existing)		
OPTICOM RECEIVER		
OPTICOM STROBE		
TRAFFIC SIGNAL		
PEDESTAL WITH PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON UNIT		
SIGNAL CONDUIT		
CONTROLLER CABINET		
METER PEDESTAL		
PULL BOX		
LOOP DETECTOR (QUADRUPOLE)		
LOOP DETECTOR (RECTANGULAR)		

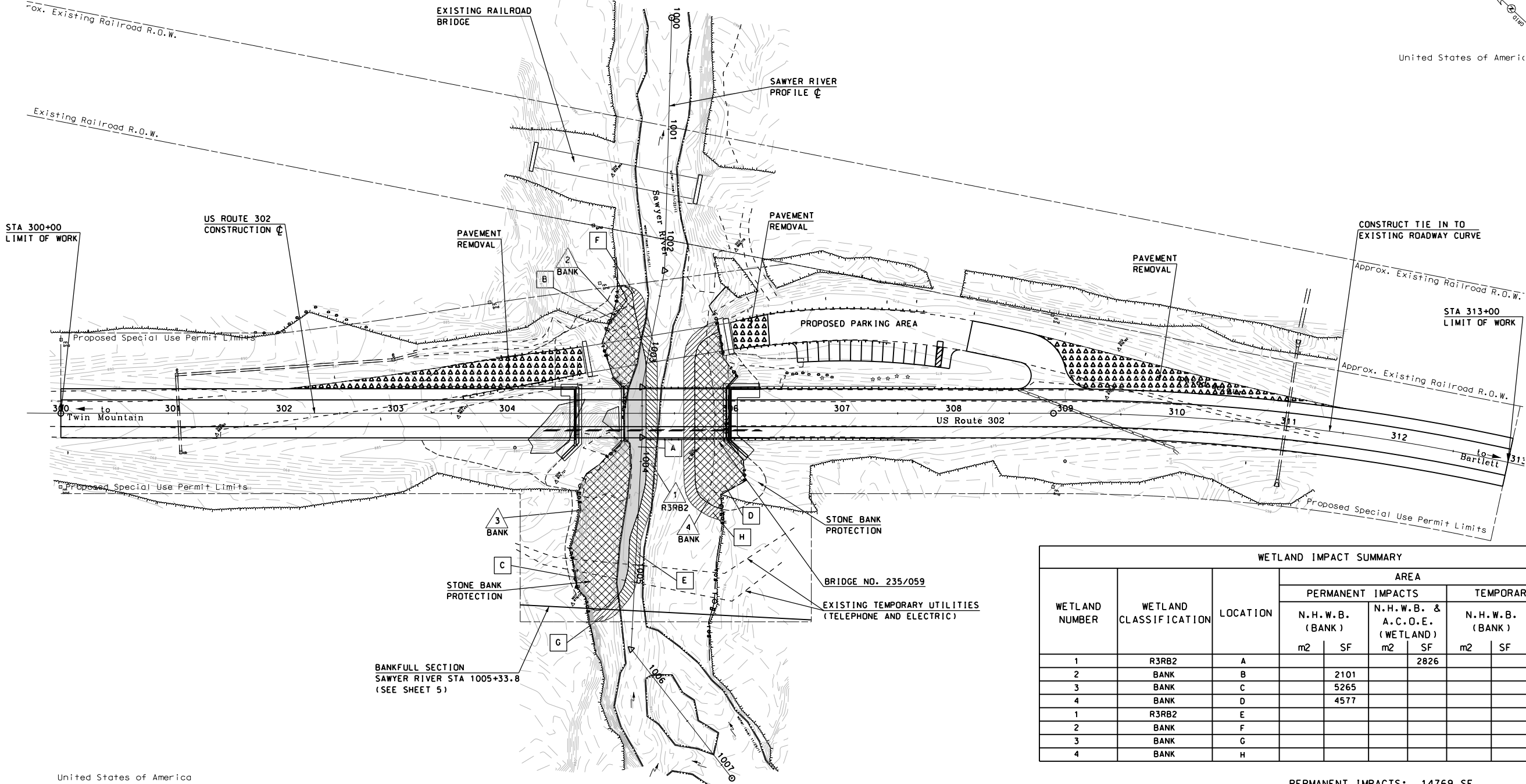
CONSTRUCTION NOTES

CURB MARK NUMBER - BITUMINOUS	B-1
CURB MARK NUMBER - GRANITE	G-1
CLEARING AND GRUBBING AREA	
DRAINAGE NOTE	
EROSION CONTROL NOTE	
FENCING NOTE	
GUARDRAIL NOTE	
LIGHTING NOTE	
TRAFFIC SIGNAL NOTE	

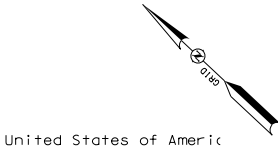
REVISIONS AFTER PROPOSAL			
NUMBER	DATE	STATION	DESCRIPTION

NOTEBOOKS	
BOOK	PAGE

EXISTING DETAIL			
DATE	DATE	DATE	DATE



STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.H.	16396A	4	



WETLAND IMPACT SUMMARY										
WETLAND NUMBER	WETLAND CLASSIFICATION	LOCATION	AREA							
			PERMANENT IMPACTS				TEMPORARY IMPACTS			
			N.H.W.B. (BANK)		N.H.W.B. & A.C.O.E. (WETLAND)		N.H.W.B. (BANK)		N.H.W.B. & A.C.O.E. (WETLAND)	
			m2	SF	m2	SF	m2	SF	m2	SF
1	R3RB2	A				2826				
2	BANK	B		2101						
3	BANK	C		5265						
4	BANK	D		4577						
1	R3RB2	E								2540
2	BANK	F							329	
3	BANK	G							315	
4	BANK	H							1963	

PERMANENT IMPACTS: 14769 SF
TEMPORARY IMPACTS: 5147 SF

TOTAL IMPACTS: 19916 SF



LEGEND

TYPE OF WETLAND IMPACT	SHADING/HATCHING
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT BANK)	
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	
NEW HAMPSHIRE WETLANDS BUREAU (TEMPORARY BANK)	
NEW HAMPSHIRE WETLANDS BUREAU (TEMPORARY WETLAND)	

- # WETLAND DESIGNATION NUMBER
- # WETLAND IMPACT LOCATION

WETLAND CLASSIFICATION CODES	
R3RB2	UPPER PERENNIAL RIVER, ROCK BOTTOM, RUBBLE SUBSTRATE
BANK	NHDES JURISDICTIONAL BANK

NOTE:

CONCEPTUAL LEVEL ENGINEERING PLANS ARE BEING PROVIDED AS A PART OF THE APPLICATION FOR RIP-RAP IN EXCESS OF 100 LINEAR FEET ALONG THE STREAM BANK. AS A DESIGN-BUILD PROJECT, FINAL STAMPED PLANS WILL NOT BE AVAILABLE UNTIL AFTER THE ADVERTISEMENT OF THE PROJECT, AND THESE WILL BE FORWARDED BY THE SELECTED DESIGN-BUILDER TO THE WETLANDS BUREAU AT THAT TIME.

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION

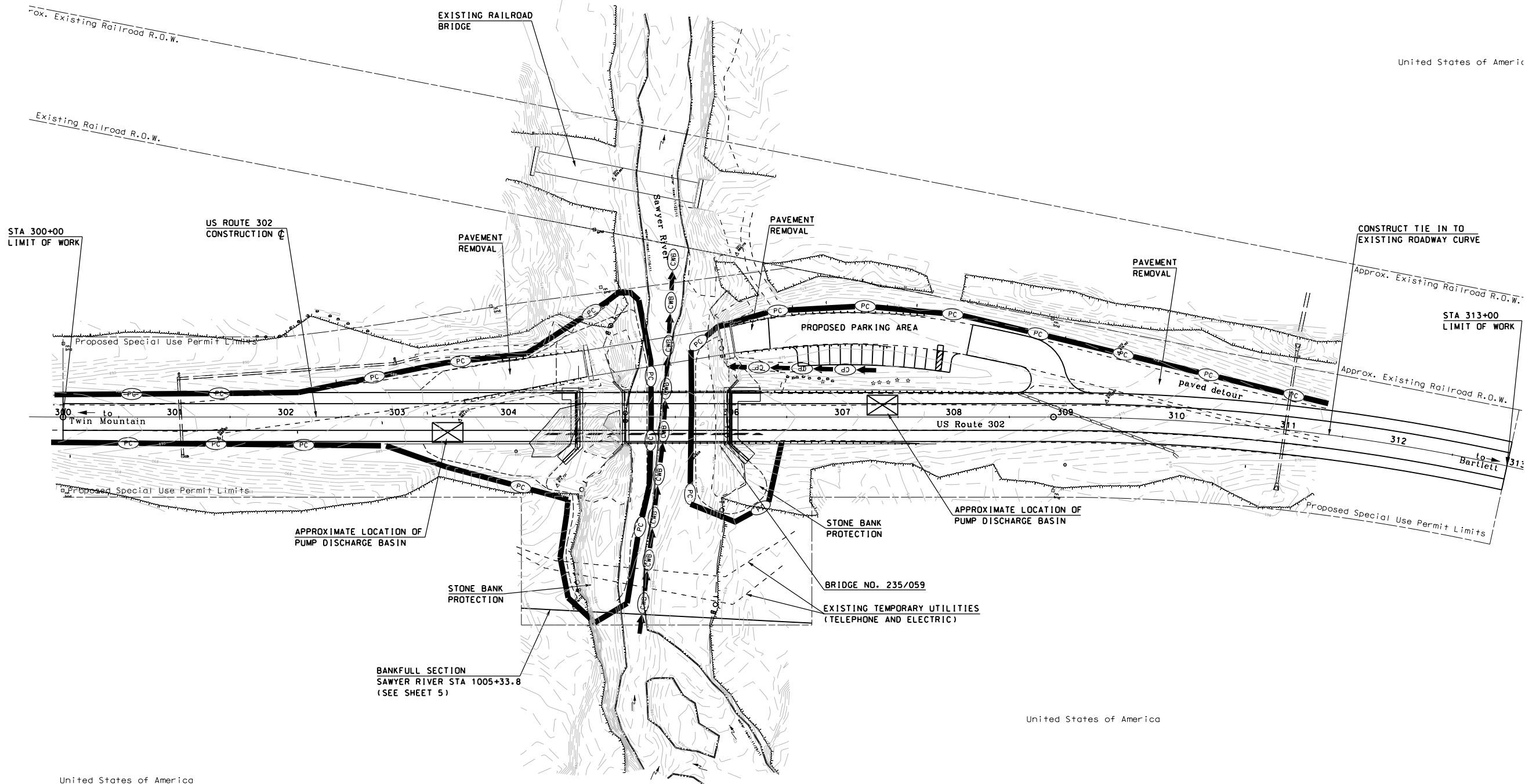
BUREAU OF HIGHWAY DESIGN

WETLAND IMPACT PLAN

FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
	16396A	4	

EXISTING DETAIL		DATE		DATE		DATE		DATE	
PROPOSED DESIGN									
SHEET CHECKED									
AS BUILT DETAILS									
NOTEBOOKS		BOOK		PAGE		BOOK		PAGE	
REVISIONS AFTER PROPOSAL		NUMBER		DATE		STATION		STATION	
DESCRIPTION									

EROSION CONTROL PLAN LEGEND	
	PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
	CHANNEL PROTECTION STONE CHECK DAMS STRAW WATTLES CHANNEL MATTING CLASS D EROSION STONE CLASS C STONE
	CLEAN WATER BYPASS PUMP THROUGH PIPE DRAIN THROUGH PIPE OR CHANNEL



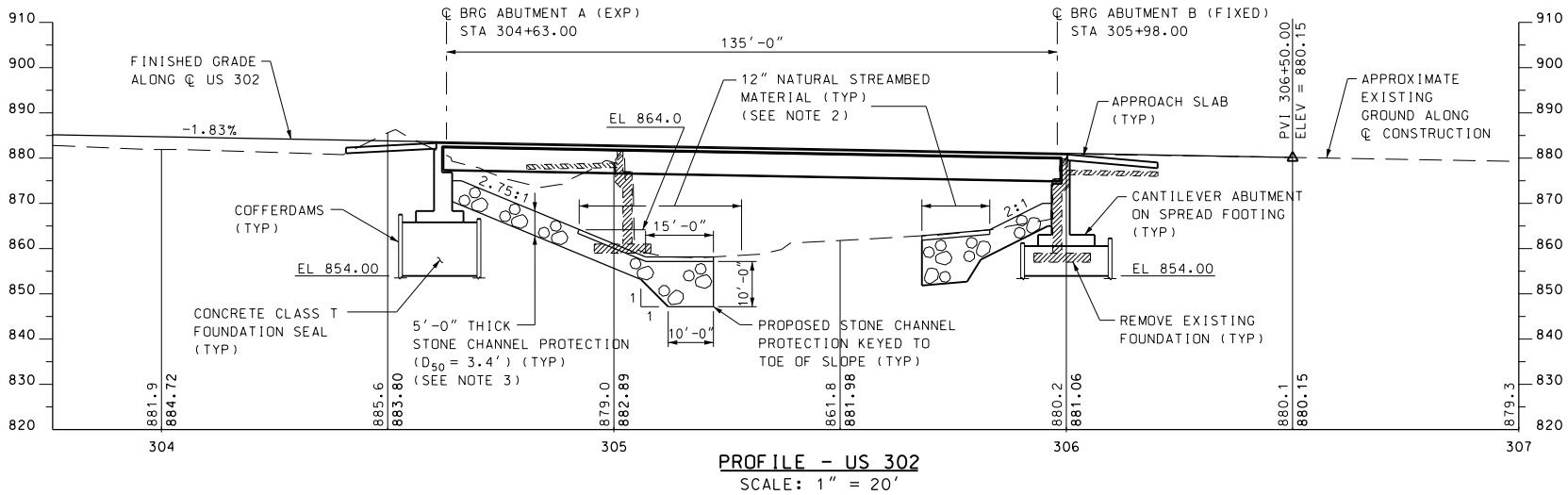
NOTE:
1. PERIMETER CONTROL ADJACENT TO SAWYER RIVER
TO ISOLATE THE WORK AREA FROM THE RIVER FLOW.

STATE OF NEW HAMPSHIRE			
DEPARTMENT OF TRANSPORTATION		◦	BUREAU OF HIGHWAY DESIGN
WATER DIVERSION AND EROSION CONTROL PLAN			
FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
	16396A	5	

EXISTING DETAIL		DATE		NOTEBOOKS		REVISIONS AFTER PROPOSAL			
PROPOSED DESIGN		DATE		BOOK		NUMBER	DATE	STATION	DESCRIPTION
SHEET CHECKED		DATE		BOOK					
AS BUILT DETAILS		DATE		BOOK					

EXISTING DETAIL		DATE		NOTEBOOKS		REVISIONS AFTER PROPOSAL			
						NUMBER	DATE	STATION	DESCRIPTION
PROPOSED DESIGN	DATE			BOOK	PAGE				
SHEET CHECKED	DATE			BOOK	PAGE				
AS BUILT DETAILS	DATE								

STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
N.H.	16396A	8	



NOTE:
SEE WETLAND IMPACT PLAN, SHEET 4 FOR COMPLETE
LIMITS OF STONE CHANNEL PROTECTION

STATE OF NEW HAMPSHIRE			
DEPARTMENT OF TRANSPORTATION		◦	BUREAU OF HIGHWAY DESIGN
PROPOSED RIPRAP CROSS SECTION			
FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
	16396A	8	

SCALE:
1" = 20' HORIZ.
1" = 20' VERT.